



Apiaceae across time: A comparative study of medicinal uses from Dioscorides and Ibn Al-Baytar to contemporary Northeastern Morocco

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Ethnobotany Research and Applications 33:59 (2026) - <http://dx.doi.org/10.32859/era.33.59.1-18>

Manuscript received: 28/12/2026 - Revised manuscript received: 10/03/2026 - Published: 11/03/2026

Research

Abstract

Background: This study examines how medicinal knowledge related to the Apiaceae family has changed over time. Contemporary ethnobotanical data from Northeastern Morocco (Al Hoceima, Nador, and Jerada) were compared with information found in two historical texts: *De Materia Medica* by Dioscorides (1st century CE) and the *Compendium on Simple Medicaments and Foods* by Ibn Al-Baytar (13th century). The aim was to identify which traditional uses have persisted, changed, or disappeared.

Methods: Field surveys carried out between 2017 and 2019 involved 1,177 informants. All reported uses were classified according to the ICPC-2 system. The Jaccard Index was used to measure similarity between the three sources, both by species and by groups of diseases. Heatmaps and hierarchical clustering were used to visualize patterns.

Results: The results showed that the transmission of medicinal knowledge was uneven. Some groups of diseases, especially digestive disorders (D), show clear continuity between past and present. Other groups displayed very low or zero similarity values, indicating a loss of some practices. At the species level, some taxa showed stable uses across all sources, some retain only part of their former uses, and others show a complete break with historical knowledge.

Conclusions: Overall, the study shows that traditional knowledge doesn't evolve in a uniform way. Some uses persist, others change, and many disappear. Understanding these patterns helps document the history of Moroccan medicinal knowledge and show the importance of preserving ethnobotanical traditions.

Keywords: Apiaceae; Dioscorides, Ibn-Al Baytar, Contemporary ethnobotany, Morocco

Background

The Apiaceae (previously known as Umbelliferae) is one of the largest and most widely distributed plant families (Pimenov & Leonov 1993). It comprises an estimated 3,000 to 3,700 species grouped into 452 accepted genera (POWO 2026).

This family is abundant worldwide, especially in the temperate regions of the Northern hemisphere (Sayed-Ahmad 2017), with the Mediterranean basin recognized as a key center of diversity (Heywood 1999). Morocco, a hotspot within the Mediterranean region, hosts a wide variety of Apiaceae species, some of which are endemic or sub-endemic (Fennane & Ibn

Tattou 1999; Fennane *et al.* 2007), making them important not only from a botanical perspective but also in terms of conservation.

In addition to their ecological importance, these taxa have been used in traditional medicine for the treatment of various diseases (Khare 2008; Pandey *et al.* 2012; Saleem *et al.* 2017; Kozhanova *et al.* 2025), which reflect the close relationship between human population and their environment, especially because plant extracts are rich in natural antioxidants (Shan *et al.* 2005; Johri 2011; Oroian & Escriche 2015; Shahidi & Ambigaipalan 2015; Yashin *et al.* 2017; Mollazadeh *et al.* 2019) and are widely studied for cosmetic and pharmaceutical uses (Brinkhaus *et al.* 2000; Aćimović *et al.* 2015; Zofia *et al.* 2020; Hajlaoui *et al.* 2021). In Morocco, various uses are reported in the literature for taxa belonging to this family. For example, they are reported to be used by local populations in different parts of Morocco for gastrointestinal complaints, respiratory ailments, and are known for their anti-inflammatory and analgesic properties (Bellakhdar 1997; Merzouki *et al.* 2000; El-Hilaly *et al.* 2003; Smaili *et al.* 2023; Mir *et al.* 2024). Ethnobotanical research conducted in various provinces of Morocco has established Apiaceae as one of the most frequently cited botanical families in surveys conducted from 2017 to 2019 (Smaili *et al.* 2023; Mir *et al.* 2024).

Furthermore, historical literature by renowned scholars such as Dioscorides and Ibn Al-Baytar also makes frequently references to several Apiaceae taxa, detailing their therapeutic uses and preparation methods. These records highlight a remarkable continuity of use across centuries and geographies, as Apiaceae taxa are well-known for their medicinal use since ancient times (Thiviya *et al.* 2021).

While cataloging traditional uses is fundamental, it is equally important to conduct a historical analysis of ethnobotanical knowledge to try understand how it is structured, transmitted, and transformed over time and space. The present study is situated within this analytical framework. Based on ethnobotanical fieldwork conducted in Northeastern Morocco, we aim to achieve two primary objectives: (1) to identify patterns of similarity and specificity in the therapeutic uses of taxa belonging to Apiaceae as reported by local populations across various disease categories, and (2) to map cluster of species based on the Jaccard similarity index, in order to reveal latent structures in traditional medicinal knowledge.

Materials and Methods

Context of field and historical data

The contemporary ethnobotanical data used in this study come from a large-scale research work conducted in Northeastern Morocco between 2017 and 2019, covering three distinct provinces: Al Hoceima, Nador, and Jerada. This fieldwork was carried by our team using a rigorous methodology and has already been published in two previous scientific articles (Smaili *et al.* 2023; Mir *et al.* 2024). These studies documented local medicinal plant knowledge, with a particular focus on Amazigh tribes of Aït Waryaghel (Al Hoceima), the Guelaya (Nador), and the Arabized populations of Jerada.

During this fieldwork, semi-structured ethnobotanical interviews were conducted with 1,177 informants (410 in Al Hoceima, 387 in Nador, and 380 in Jerada). These interviews detailed data on medicinal plant uses were gathered. Taxa were collected and identified at the Faculty of Sciences of Tetouan, following the recent local botanical checklist (Fennane & Rejdali 2016). All scientific names were updated to the currently accepted names using the plants of the World Online database (<https://powo.science.kew.org/>). Furthermore, plant species were classified into their respective families following the Angiosperm Phylogeny (APG IV 2016) and Pteridophyte Phylogeny Group (PPG I 2016) classifications.

For the present study, we focused exclusively on species from the Apiaceae family, well known for its ethnomedicinal importance in the Mediterranean region. In order to carry out a comparative analysis of traditional uses associated with this family between actual data from our field work and historical texts.

We used three main sources of data:

Ancient texts:

De Materia Medica by Dioscorides. We used the French edition published in 1553.

Al Jam' li-Mufradat al-Adwiya wa'l-Aghdiya (Compendium on Simple Medicaments and Foods) by Ibn Al-Baytar. We used two versions: the French edition translated by Leclerc (1877-1883) and the Arabic edition published in 1992.

Contemporary field data:

Collected through the surveys mentioned above.

The physician Dioscorides of Anazarbus wrote *De Materia Medica* in the 1st century CE, the first systematic treatise on medicinal plants and foundational text of early pharmacognosy. The work of Dioscorides is the result of years spent travelling with Roman soldiers across Anatolia, Arabia, Egypt, Persia, North Africa, and parts of Europe, where he observed local healing practices and documented the medicinal properties of the plants he encountered (Riddle, 1980, 1985; Scarborough & Nutton 1982; Yildirim 2012; Staub *et al.* 2016). Across its five books, Dioscorides described more than 600 plant species, along with several animal and mineral-based remedies (Gunther 1968; Kiran 2017; Kiran & Kadioğlu 2020; Marselos & Valiakos 2022) and due to its accuracy and scope, *De Materia Medica* served a millennium and more as a constant source of reference to botanists and physicians in Greek, Latin, and Arabic academic traditions. (Osbaldeston 2000; Beck 2011; Evergetis & Haroutounian 2015).

Ibn Al-Baytar (ca. 1197-1248 CE), born in Málaga and trained under the eminent botanist Abu Al-Abbas Al-Nabati, is considered one of the most rigorous pharmacognosists of the medieval Islamic world. During his long travel across North Africa, Al Andalus, the Levant and the Near East, Ibn Al-Baytar collected information directly from healers and herbalists, a practice that strongly marked the empirical tone of his work (Cabo Gonzalez & Lanly 1997; Kaçar & Ahmed 2025; Applequist 2025). His main treatise, the *Compendium on Simple Medicaments and Foods*, synthesizes material from earlier, Greek and Arabic authors with his own field observations. It contains more than 2,300 alphabetically organized entries, corresponding to roughly 1,400 distinct substances once duplications and synonymies are accounted for (Cabo Gonzalez & Lanly 1997; Applequist 2025). Widely regarded as the most comprehensive *Materia Medica* of its time, the work presents details descriptions of plant identities and therapeutic properties and has led scholars to describe Ibn Al-Baytar as the greatest botanist and pharmacist of Islam and of the Middle Ages (Yavuz 2018; Mirzaev & Majidov 2025; Gimeno *et al.* 2025).

To ensure that taxa mentioned in ancient texts truly correspond to those cited in our ethnobotanical surveys, we consulted several key works that have analyzed these historical manuscripts:

- *La pharmacopée marocaine traditionnelle* by Bellakhder (1997)
- *De Materia Medica*, translated and edited by Lily Y. Beck (2005)
- *The Cilician Dioscorides' Plant Materia Medica as Appeared in Ibn Al-Baytar, the Arab Herbalist of the 13th Century* by Mohamed Nazir Sankary (1991)

These references allowed us to ensure consistency and accurate correspondence between the species described in historical manuscripts and those documented in our fieldwork.

Historical sources are used in ethnopharmacological studies (Heinrich *et al.* 2006; Leonti *et al.* 2010; Benítez *et al.* 2021). However, edited translations can sometimes create difficulties in interpretation, especially when plant descriptions or vernacular names are unclear. For this reason, careful botanical identification remains essential in this type of study (Bennett and Balick 2014; Rivera *et al.* 2014). To reduce issues related to synonymy and nomenclatural ambiguity, the taxa mentioned in historical texts were cross-checked against specialized secondary literature and verified using POWO. As taxonomic ambiguity is common in historical ethnobotanical research, in situation of taxonomic uncertainty, taxa were identified at the most reliable taxonomic level supported by the available literature. This approach was used to avoid over-interpretation.

Data structuring and preparation

To ensure consistency in analysis, data were organized into binary matrices using Microsoft Excel. Rows represent species from the Apiaceae family present in at least one of the three sources, and columns represent types of medicinal uses, categorized according to the WHO's International Classification of Primary Care (ICPC-2), as suggested by Staub *et al.* (2015). A binary matrix was constructed for each source, where each cell indicates the presence (1) or absence (0) of a specific use in that source to facilitate the study overlaps and specificities between sources.

Similarity analysis: Jaccard index

To assess the proximity of medicinal uses between the three sources, we used the Jaccard index, a common measure in ethnobotanical research (González-Tejero *et al.* 2008; El-Gharbaoui *et al.* 2017).

$$JI = \left[\frac{C}{(A + B - C)} \right] \times 100$$

This index was calculated using two complementary approaches; for each taxon present in at least two sources (Dioscorides/Ibn Al-Baytar; Dioscorides/Field; Ibn Al-Baytar/Field), and for each therapeutic group (e.g., digestive, respiratory, skin), again comparing the same source pairs. Results were visualized using a heatmap, and analyses were performed using RStudio.

To better understand the global structure of medicinal uses and taxa, we performed a hierarchical clustering analysis on the combined dataset (Dioscorides, Ibn Al-Baytar, Field). The results were visualized with a dendrogram that was divided into four clusters, each representing a usage profile:

- Taxa with lost transmission across time,
- Taxa partly preserved nowadays,
- Taxa with intermediate continuity,
- Taxa with persistent ethnobotanical core.

Results and Discussion

Taxa analysis

We recorded 21 taxa belonging to the Apiaceae family, which form the basis of this study (Annex 1). The annex presents, for each taxon, the vernacular names and the medicinal uses reported in the three sources studied: Dioscorides, Ibn Al-Baytar, and contemporary ethnobotanical surveys carried out in the Northeastern Morocco.

The Venn diagram (Figure 1) shows the distribution of taxa among the three sources. It reveals that 18 taxa are shared by all sources. Four taxa are common to the contemporary data and Ibn Al-Baytar but are absent from Dioscorides, while two taxa, *Ammodaucus leucotrichus* Cossone & Durieu and *Petroselinum crispum* subsp. *Crispum*, are specific to the contemporary data.

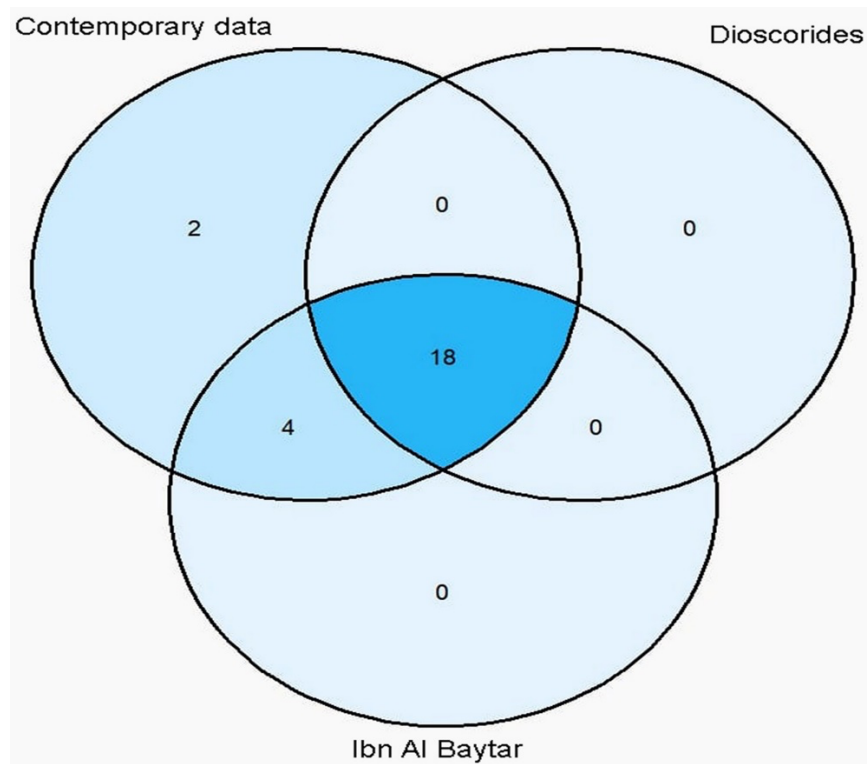
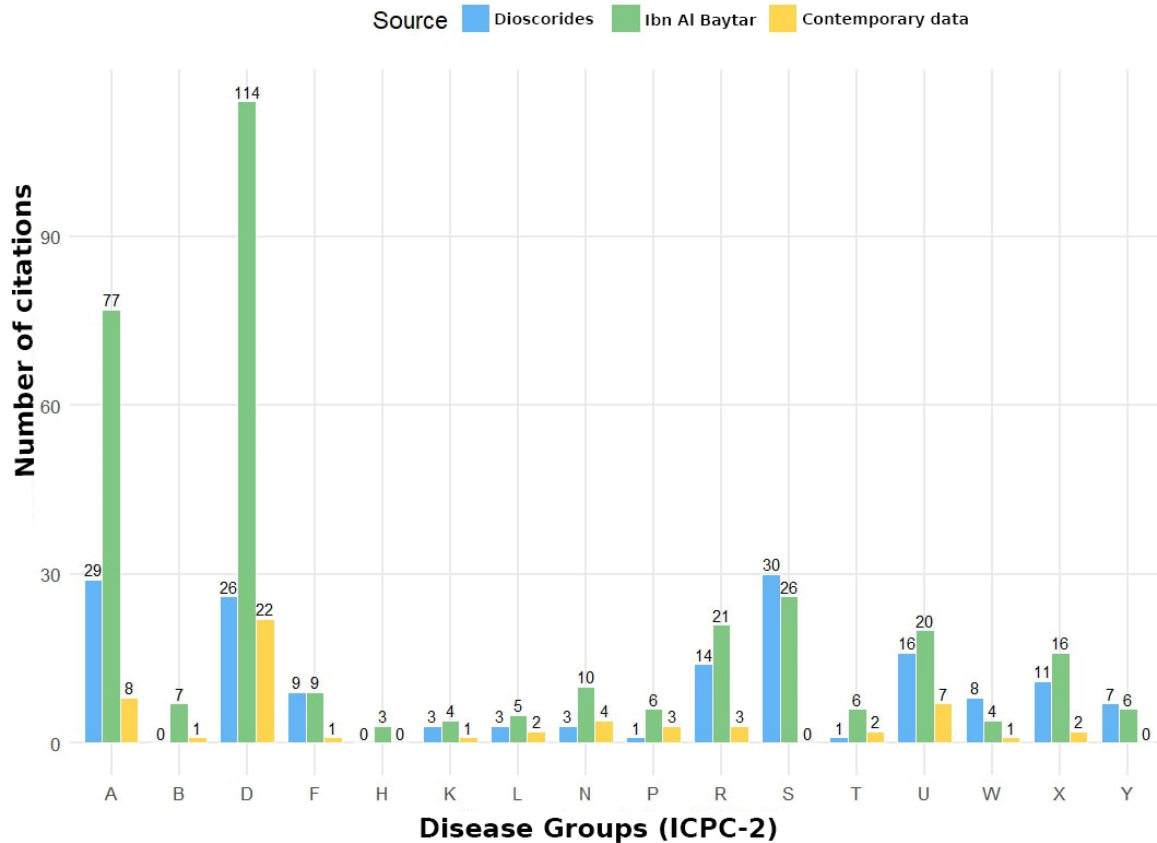


Figure 1. Venn diagram of Apiaceae taxa shared between contemporary data of Northeastern of Morocco and historical sources (Dioscorides, Ibn Al-Baytar)

In general (Figure 2), group S (Skin) is the most cited category in Dioscorides (30 citations), while group D (digestive system) is the most represented in both Ibn Al-Baytar (114 citations) and in the contemporary data (22 citations).

The results above are consistent with studies that show that many taxa in this family are rich in phenolic compounds and flavonoids, which give them strong antioxidant activity (Zainol *et al.* 2003; Pandey *et al.* 2012; Zofia *et al.* 2020). Furthermore, these antioxidants are also widely used in cosmetics (Pisoschi *et al.* 2016) which may be related to skin disease group. Oils or extracts from Apiaceae seeds are commonly added to pharmaceutical and cosmetic products (Sayed-Ahmed *et al.* 2017). Such compounds are well-known for supporting digestive functions and protecting the skin, which aligns with the high continuity observed in these two groups.



(A) : General and unspecified; (B) : Blood, Blood forming, Organs and immune mechanism; (D) : Digestive ; (F) : Eye ; (H) : Ear ; (K) : Cardiovascular ; (L) : Musculoskeletal; (N) : Neurological ; (P) : Psychological ; (R) : Respiratory ; (S) : Skin ; (T) : Endocrine/Metabolic and Nutritional ; (U) : Urological ; (W) : Pregnancy, childbearing, Family Planning ; (X) : Female Genital ; (Y) : Male Genital.

Figure 2. Comparison of the number of medicinal-use citations by disease groups (ICPC-2) across the three sources

Likewise (Figure 3), *Ammi majus* L. appears as the species with highest number of medicinal citations in Ibn Al-Baytar (32 uses). In Dioscorides, the most cited species is *Magydaris* Spp. (34 uses), while in the contemporary data, *Coriandrum sativum* L. occupies the first rank with 7 citations.

As expected, the total number of medicinal uses is higher in the ancient sources, with 161 uses recorded by Dioscorides and 334 uses by Ibn Al-Baytar, compared to only 57 uses reported by the local population of Northeastern Morocco in the contemporary surveys.

Comparison by disease groups

The values obtained from the Jaccard index by disease group (Table 1) are visualized in a heatmap (Figure 4), providing a representation of the dynamics of ethnobotanical knowledge transmission across three historical periods: Antiquity (Dioscorides), the Middle Ages (Ibn Al-Baytar), and the contemporary era (field data).

In general, these findings show that the continuity of medicinal uses within the Apiaceae family is heterogeneous across disease groups (Figure 4). The highest Jaccard values were observed for digestive diseases (D) with 0.72 between Dioscorides and Ibn Al-Baytar, 0.41 between Dioscorides and contemporary data, and 0.5 between Ibn Al-Baytar and contemporary data (Table 1).

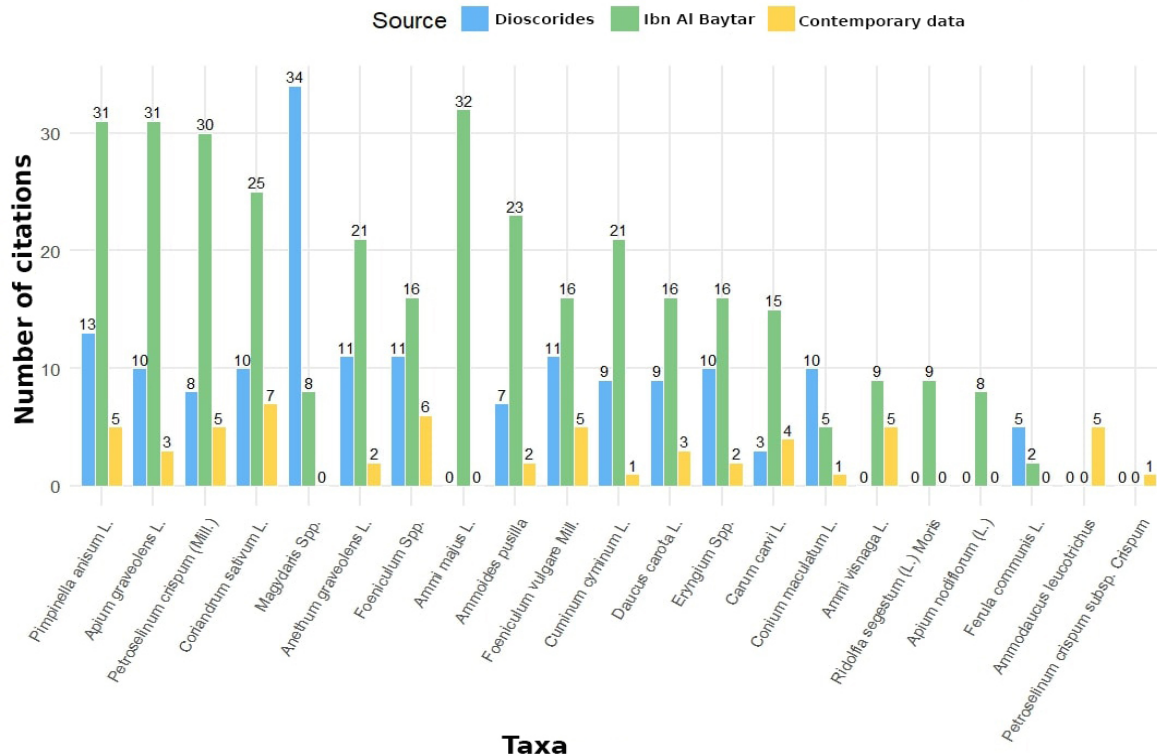


Figure 3. Comparison of the number of medicinal-use citations per taxon across the three sources

Table 1. Jaccard similarity Index by disease group across three sources

Disease	Jl Dioscorides/Ibn Al-Baytar	Jl Dioscorides/Contemporary data	Jl Ibn Al-Baytar/Contemporary data
A (General and unspecified)	0.63	0.23	0.16
B (Blood, Blood forming, Organs and immune mechanism)	0	0	0.2
D (Digestive)	0.72	0.41	0.5
F (Eye)	0.25	0	0
H (Ear)	0	-	0
K (Cardiovascular)	0.33	0	0
L (Musculoskeletal)	0.25	0.25	0
N (Neurological)	0	0	0.14
P (Psychological)	0	0.33	0.16
R (Respiratory)	0.15	0	0.09
S (Skin)	0.5	0	0
T (Endocrine/Metabolic and Nutritional)	0	0.5	0
U (Urological)	0.57	0	0.41
W (Pregnancy, childbearing, Family Planning)	0.09	0	0
X (Female Genital)	0.58	0	0
Y (Male Genital)	0.28	0	0

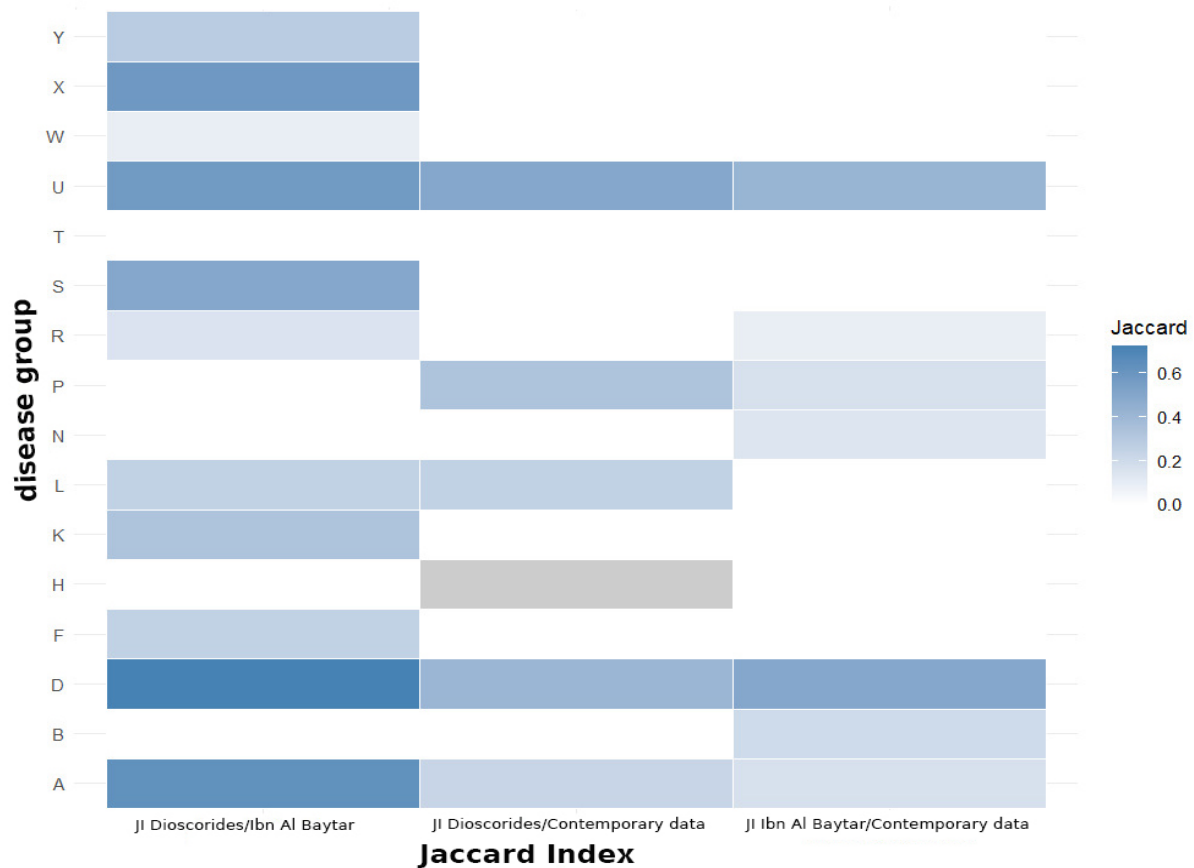


Figure 4. Jaccard Index for each disease group across three sources

This strong similarity reflects a stable and continuous transmission of knowledge related to the treatment of digestive disorders (Figure 4), which have remained a major axis of traditional pharmacopoeia since Antiquity and are consistent with most ethnobotanical studies conducted in Morocco (Merzouki *et al.* 2000; Ouhaddou *et al.* 2014; Belhaj *et al.* 2020; Idm'hand *et al.* 2020; El-Assri *et al.* 2021; EL-Ghazouani *et al.* 2021; Jeddi *et al.* 2021; El Khomsi *et al.* 2022). Digestive disorders are among the most common health problems worldwide, and many studies confirm that they represent one of the major causes of morbidity and mortality (WHO 2013; Tangjitman *et al.* 2015; Lenti *et al.* 2019; Mansouri *et al.* 2025), which explain why digestive problems remain the most stable category across time.

Other disease groups also display a moderate level of continuity (Figure 4). The urinary system group (U) recorded Jaccard values of 0.57 between Dioscorides and Ibn Al-Baytar, and 0.41 between Ibn Al-Baytar and contemporary data (Table 1), suggesting that some uses related to this group have continued over time. The general and unspecified group (A) and skin related diseases (S) also show relatively high similarity value (0.63 and 0.5, respectively, between Dioscorides and Ibn Al-Baytar), which points to a partial but enduring retention of ancient medicinal practices.

In contrast, several groups show very low or zero indices (Table 1), indicating an almost complete disappearance of uses between historical sources and contemporary knowledge. This is the case for hematopoietic (B), neurological (N), psychological (P), female Genital (X) diseases, and pregnancy, childbearing, family planning group (W).

These gaps indicate a selective erosion of traditional therapeutic knowledge, particularly in fields now dominated by modern medicine (Smaili *et al.*, 2023; Mir *et al.*, 2024). It is worth noting that digestive and urinary treatments are still among the most resilient in traditional medicine. The transmission of knowledge within the Apiaceae family appears uneven, likely influenced by perceived plant efficacy, availability, and enduring cultural relevance.

Comparison at the taxa level

The hierarchical classification (Figure 5) distinguishes four main groups that illustrate different dynamics in the transmission of ethnobotanical knowledge within the Apiaceae family.

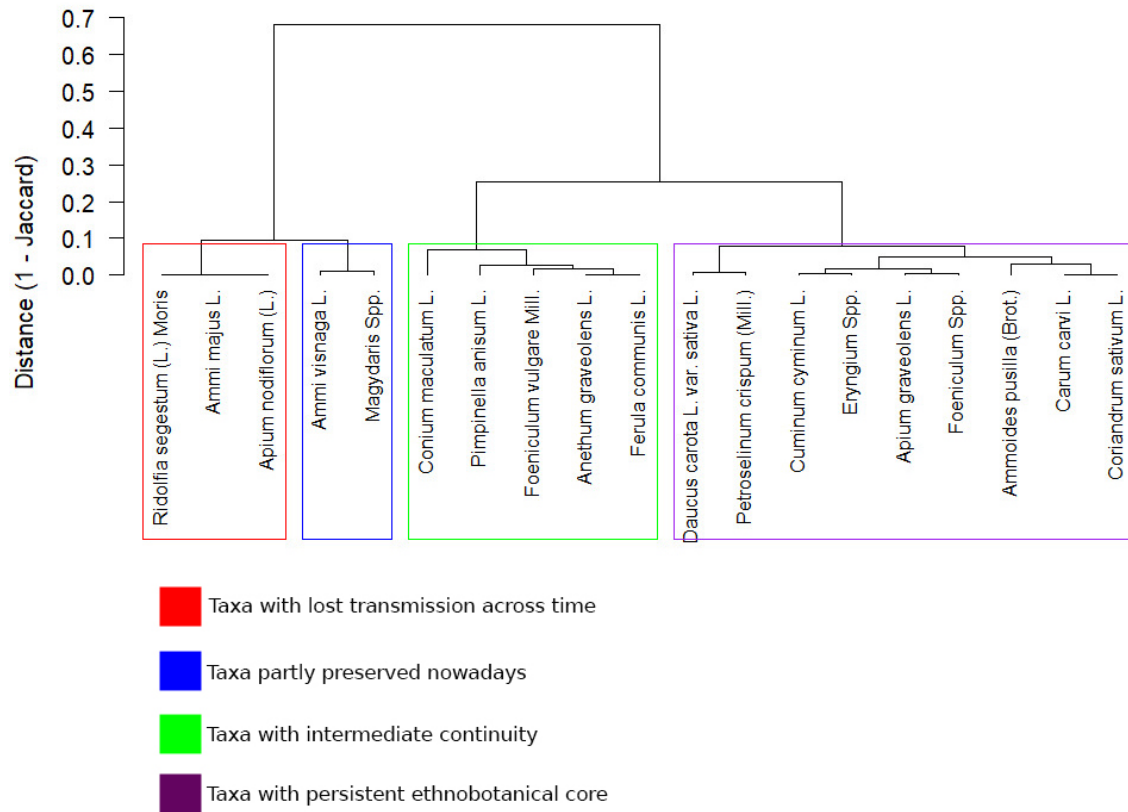


Figure 5. Hierarchical Clustering of Apiaceae Taxa based on Jaccard Distance

The first group (Figure 5) gathers taxa with lost transmission across time, showing no continuity between historical records and contemporary use. This cluster include taxa such as *Ammi majus* L., *Apium nodiflorum* (L.) Lag. and *Ridolfia segestum* (L.) Moris, which were mentioned by Ibn Al-Baytar for many pathological groups, yet it has disappeared from current popular use. Although these three taxa are not cited by Dioscorides, their presence in the Arab-Islamic tradition indicates that certain ethnobotanical knowledge became established and persisted, likely sustained by local ecology and most probably cultural attachment to these species, rather than inherited directly from Greco-Roman medicine.

The second group (Figure 5) includes species that are partly preserved. *Magydaris* Spp. appears to have been transmitted between Dioscorides and Ibn Al-Baytar but shows no evidence of medicinal use in contemporary data, while *Ammi visnaga* L. has persisted between Ibn Al-Baytar's writings and present-day ethnobotanical data.

The third group bring together taxa with intermediate continuity, including *Conium maculatum* L., *Pimpinella anisum* L., *Foeniculum vulgare* Mill., *Anethum graveolens* L., and *Ferula communis* L. these taxa were described by both Dioscorides and Ibn Al-Baytar for a variety of diseases, most often digestive or general and unspecified, and sometimes other groups such as skin disorders. Their medicinal importance, however, seems to have faded over time. In present times, people tend to use these taxa for flavoring or as aromatic herbs, while their medicinal role has almost disappeared to be nowadays used for a limited number of diseases.

The fourth group (Figure 5) include taxa with persistent ethnobotanical core: *Coriandrum sativum* L., *Carum carvi* L., *Apium graveolens* L., *Foeniculum* Spp., *Ammoides pusilla* (Brot.), *Petroselinum crispum* (Mill.), *Cuminum cyminum* L., *Daucus carota* L. var. *sativa* L., and *Eryngium* Spp. These taxa show persistent ethnobotanical knowledge between ancient records and present-day field data. They appear in the writings of both Dioscorides and Ibn Al-Baytar and are still used by local communities, mostly for digestive or respiratory problems. However, their uses have narrowed and become more specific over time. This suggests that local people have adapted traditional knowledge in a practical way to modern life, especially given their continued presence in Moroccan cuisine.

Conclusion

This study compared the medicinal uses of Apiaceae taxa recorded in Northeastern Morocco with those described in two historical manuscripts *De Materia Medica* by Dioscorides (1st century CE) and *the Compendium on Simple Medicaments and Foods* by Ibn Al-Baytar (13th century CE). The goal was to see which uses have continued, changed, or disappeared. Contemporary data were collected between 2017 and 2019 from 1,177 informants in three provinces (Al Hoceima, Nador, and Jerada).

The Jaccard Index shows that the transmission of medicinal knowledge in the Apiaceae family was not uniform. Digestive disorders (D) represented the group with the highest similarity between the sources. They showed a strong continuity from Antiquity to today (JI = 0.41 between Dioscorides and contemporary data, and up to 0.5 between Ibn Al-Baytar and contemporary data). Other groups with the highest showed moderate similarity, such as the urinary system (U). However, many categories have values close to zero, indicating that these uses didn't survive in current practice.

At taxa level analysis confirmed this mixed pattern. Some taxa continued to be used today in a way that is consistent with historical records. This was the case of *Coriandrum sativum* L., *Carum carvi* L., *Apium graveolens* L., *Foeniculum* Spp., *Ammoides pusilla* (Brot.), *Petroselinum crispum* (Mill.), *Cuminum cyminum* L., *Daucus carota* L. var. *sativa* L., and *Eryngium* Spp. Most of their uses today related to digestive or respiratory problems, and this continuity may have been linked to their effectiveness and regular presence in Moroccan cuisine.

Other species showed only partial transmission. *Magydaris* Spp. and *Ammi visnaga* L., the first persisted between the two historical sources and the second persisted between Ibn Al-Baytar and the contemporary data.

Finally, some taxa showed no continuity at all. *Ammi majus* L., *Apium nodiflorum* (L.) Lag. and *Ridolfia segestum* (L.) were well described by Ibn Al-Baytar, but they were no longer used by local populations. This showed a complete loss of these traditional medicinal uses.

In summary, the results showed that ethnobotanical knowledge related to the Apiaceae family has changed in different ways. Indeed, some uses have persisted, while others have been changed or completely lost. Understanding these patterns was important for documenting the history of Moroccan traditional medicine and for preserving a cultural heritage that continues to evolve.

Declarations

List of abbreviations: APG IV: Angiosperm Phylogeny Group, ICPC-2: International Classification of Primary Care, 2nd edition, PPG I: Pteridophyte Phylogeny Group, WHO: World Health Organization.

Ethics approval and consent to participate: Participation in this study was strictly voluntary; all individuals provided informed consent prior to the interviews and agreed to the sharing of their traditional knowledge.

Consent for publication: Not applicable

Availability of data and materials: All the data is presented in figures and tables in the manuscript and is available with the corresponding author.

Competing interests: The authors confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Funding: This research did not receive any specific grant.

Author contributions: F.Z.M. Conceptualization and design of the study, investigation and data collection, data analysis and interpretation, writing – original draft preparation. H.S. Conceptualization and design of the study, investigation and data collection, data analysis and interpretation, writing – original draft preparation. A.M. Methodology validation, project administration, review and editing.

Acknowledgements

The authors deliver their gratitude to all informants for taking the time to complete the survey. Their participation was highly valuable in achieving the research goal.

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Scientific name (Voucher number)	Vernacular names	Pathological group	Dioscorides	Ibn Al-Baytar	NE Morocco
<i>Ammi majus</i> L. (MP-API-001 H)	NE Morocco: تابشنيقت, Tabchnikt, ⵜⴰⴱⵛⵏⵉⴽⵜ ⁺ Ibn Al-Baytar: أم الكلب Omm kelb Yetoua' la puante أناغورس Anaghuris Kharnoub el-khinzîr خروب الخنزير حب الكلى Habb el-cola صلوان Salouân عود اليسر O'ud el-yosr	General and unspecified (A)	0	9	0
		Digestive (D)	0	10	0
		Neurological (N)	0	1	0
		Psychological (P)	0	1	0
		Respiratory (R)	0	2	0
		Skin (S)	0	4	0
		Endocrine/Metabolic and Nutritional (T)	0	1	0
		Urological (U)	0	2	0
		Pregnancy, childbearing, Family Planning (W)	0	1	0
		Female Genital (X)	0	1	0
<i>Ammi visnaga</i> L. (MP-API-002 JHN)	NE Morocco: تبشنيخت Tbichnikht ⵜⴰⴱⵛⵏⵉⴽⵜ ⁺ ; Bachnikha, بشنيخة Ibn Al-Baytar: أطريلال Aâthirîlal, R'jel el- ghurab رجل الغراب, Djezer el-chaitane جزر الشيطان, Aacoutsâr الكثار, تلغوظة Talghoudha	General and unspecified (A)	0	3	3
		Digestive (D)	0	2	2
		Neurological (N)	0	1	0
		Psychological (P)	0	1	0
		Skin (S)	0	1	0
		Pregnancy, childbearing, Family Planning (W)	0	1	0
<i>Ammodaucus leucotrichus</i> Cossone & Durieu (MP-API-003 JHN)	NE Morocco: Kammûn eş- şõfi الكمون الصوفي ; Sammoune سمون ⵎⵎⵓⵏⵉ	General and unspecified (A)	0	0	1
		Digestive (D)	0	0	4
<i>Ammoides pusilla</i> (Brot.) (MP-API-004 JHN)	NE Morocco: نونخا Nunkha, Ibn Al-Baytar: Nanakhâh نانخواه كومنون Kouminon بازيليكون Basilikon	General and unspecified (A)	1	6	2
		Digestive (D)	1	9	0
		Respiratory (R)	0	2	0
		Skin (S)	2	2	0
		Endocrine/Metabolic and Nutritional (T)	0	1	0
		Urological (U)	1	2	0
		Female Genital (X)	2	1	0
<i>Anethum graveolens</i> L. (MP-API-005 JHN)	NE Morocco: كروية عمية Kerwiyâ 'amya Ibn Al-Baytar: دهن الشبت Dohn Es-Chibth شبت Chebeth	General and unspecified (A)	1	4	0
		Digestive (D)	3	6	2
		Eye (F)	1	0	0
		Ear (H)	0	2	0
		Musculoskeletal (L)	1	2	0
		Neurological (N)	0	2	0
		Psychological (P)	0	1	0
		Respiratory (R)	1	0	0
		Skin (S)	0	1	0
		Urological (U)	1	2	0
		Pregnancy, childbearing, Family Planning (W)	1	1	0
		Female Genital (X)	1	2	0
		Male Genital (Y)	1	0	0
		<i>Apium graveolens</i> L. (MP-API-006 JHN)	NE Morocco: الكرفس, âl-krâfs, عروق الكرفس, 'rwq âl-krâfs, Ibn Al-Baytar: كرفس Kerefs	General and unspecified (A)	1
Blood, Blood forming, Organs and immune mechanism (B)	0			1	0

	Kerefs Machriqi كرفس مشرقى Yakhsis يخصص	Digestive (D)	4	13	0
		Eye (F)	1	0	0
		Musculoskeletal (L)	0	0	1
		Respiratory (R)	1	2	0
		Skin (S)	1	3	0
		Endocrine/Metabolic and Nutritional (T)	0	1	0
		Urological (U)	1	3	1
		Pregnancy, childbearing, Family Planning (W)	1	0	0
		Female Genital (X)	0	2	0
		Male Genital (Y)	0	1	0
<i>Apium nodiflorum</i> (L.) Lag. (MP-Api-007 JH)	NE Morocco: Ziyata, زياتة Ziyateth, زيانت, زيانت Ibn Al-Baytar: Djerdir el-mâ جرجير الماء Korret el aïn قررة العين Raouâs رواس	General and unspecified (A)	0	5	0
		Digestive (D)	0	1	0
		Cardiovascular (K)	0	1	0
		Musculoskeletal (L)	0	1	0
<i>Carum carvi</i> L. (MP-Api-008 JHN)	NE Morocco: Karwiyâ, كروية Ibn Al-Baytar: Qoronbad قرنباد Karâouiâ كراويا Qarîqân قريقان Qarenqân قرنقان Kemoun armeny كمون أرميني	General and unspecified (A)	1	1	0
		Digestive (D)	1	10	3
		Cardiovascular (K)	0	1	0
		Neurological (N)	0	2	0
		Respiratory (R)	0	1	1
		Urological (U)	1	0	0
<i>Conium maculatum</i> L. (MP-Api-009 J)	NE Morocco: Ziyyâta, الزياتة Ibn Al-Baytar: Choukrân شوكران Djekouta جقوطة Koneion قونيون	General and unspecified (A)	2	1	0
		Digestive (D)	0	0	1
		Eye (F)	0	1	0
		Skin (S)	2	2	0
		Pregnancy, childbearing, Family Planning (W)	1	0	0
		Female Genital (X)	2	1	0
		Male Genital (Y)	3	0	0
<i>Coriandrum sativum</i> L. (MP-Api-010 JHN)	NE Morocco: Qosbar, قسبر, Qezbor, قزبر, Rqebza*, رقبرا, OZΘЖ. Ibn Al-Baytar: Tikda تقدة Kozbera كزبرة Qilantra قلنطرة Kosberet كسبرة	General and unspecified (A)	2	3	1
		Digestive (D)	1	9	1
		Eye (F)	0	2	0
		Musculoskeletal (L)	0	1	0
		Neurological (N)	0	2	3
		Psychological (P)	0	2	1
		Respiratory (R)	0	1	0
		Skin (S)	5	2	0
		Urological (U)	0	1	0
		Pregnancy, childbearing, Family Planning (W)	0	1	0
		Female Genital (X)	0	0	1
		Male Genital (Y)	2	1	0
		<i>Cuminum cyminum</i> L. (MP-Api-011 JHN)	NE Morocco: Kemoun, الكمون Ibn Al-Baytar: Kemoun كمون Kemoun habechy كمون حبشي Kemoun berry كمون بري	General and unspecified (A)	2
Digestive (D)	1			8	1
Eye (F)	0			1	0
Psychological (P)	0			1	0
Respiratory (R)	2			1	0
Skin (S)	3			3	0

		Urological (U)	0	1	0
		Female Genital (X)	0	3	0
		Male Genital (Y)	1	1	0
<i>Daucus carota</i> L. var. <i>sativa</i> L. (MP-API-012 JHN)	NE Morocco: Khizou, خيزو Zroudiya, زرودية Ibn Al-Baytar: Istafilin اصطفلين Djezer جزر Daukou دوقوا Sabâhia صباحية Nehchel نهشل	General and unspecified (A)	1	2	0
		Blood, Blood forming, Organs and immune mechanism (B)	0	1	0
		Digestive (D)	0	4	1
		Eye (F)	0	0	1
		Cardiovascular (K)	1	1	0
		Musculoskeletal (L)	1	1	0
		Neurological (N)	0	1	0
		Skin (S)	2	1	0
		Urological (U)	1	2	1
		Pregnancy, childbearing, Family Planning (W)	2	0	0
		Female Genital (X)	1	1	0
		Male Genital (Y)	0	2	0
		<i>Eryngium triquetrum</i> Vahl. <i>Eryngium tricuspdatum</i> L. <i>Eryngium campestre</i> L. (MP-API-013 JHN)	NE Morocco: Rkhachef, رخشف OXOCH El Harach, الحرش Quoq Es-Shouk, قوق الشوك Ibn Al-Baytar: Derafil, درافيل Chindâb شنداب Dou miêt chouca ذو ماية الشوكة Dou miêt ras Chouka yehoudiya شوكة يهودية Qarsa'na قرصنة Choueiket Ibrahim شويكة إبراهيم Toufah el-jimal تفاح الجمال El-Baqla el-yahoudiya البقلة اليهودية Qoufla قوفلة Iringui ايرنجي Kethîr er-roous كثير الرؤوس	General and unspecified (A)	3
Digestive (D)	3			2	0
Musculoskeletal (L)	0			2	0
Respiratory (R)	0			1	0
Skin (S)	2			2	0
Urological (U)	1			1	2
Female Genital (X)	1			0	0
Male Genital (Y)	0			2	0
<i>Ferula communis</i> L. (MP-API-014 JHN)	NE Morocco: Boubal, بوبال Thaggult, ثاجولت XOXOII Ibn Al-Baytar: Qina قنا Kelekh كلخ Narteks نرتقس	General and unspecified (A)	2	1	0
		Digestive (D)	2	1	0
		Respiratory (R)	1	0	0
<i>Foeniculum vulgare</i> Mill. (MP-API-015 JHN)	NE Morocco: El-Besbas, البساس Ar-besbas*, أريسباس* O O O O O Ibn Al-Baytar: Berhilia برهليا Besbâs بسباس Razînedj رازيانج Chemâr شمار Qozzâh قزاح	General and unspecified (A)	0	3	0
		Blood, Blood forming, Organs and immune mechanism (B)	0	1	0
		Digestive (D)	2	6	4
		Eye (F)	2	2	0
		Cardiovascular (K)	0	0	1
		Respiratory (R)	0	3	0
		Skin (S)	2	0	0
		Urological (U)	3	3	0

		Pregnancy, childbearing, Family Planning (W)	1	0	0		
		Female Genital (X)	1	1	0		
<i>Foeniculum vulgare</i> . Mill. <i>Foeniculum vulgare</i> subsp. <i>vulgare</i> Miller (MP-API-016 JHN)	NE Morocco: Ssemâr, سمار En-nafe', النافع Ibn Al-Baytar: Berhilia برهليا Besbâs بسباس Razînedj رازيانج Chemâr شمار Qozzâh قزاح	General and unspecified (A)	0	3	0		
		Blood, Blood forming, Organs and immune mechanism (B)	0	1	0		
		Digestive (D)	2	6	2		
		Eye (F)	2	2	0		
		Psychological (P)	0	0	1		
		Respiratory (R)	0	3	1		
		Skin (S)	2	0	0		
		Endocrine/Metabolic and Nutritional (T)	0	0	1		
		Urological (U)	3	3	1		
		Pregnancy, childbearing, Family Planning (W)	1	0	0		
		Female Genital (X)	1	1	0		
		<i>Magydaris panicifolia</i> (Vahl.) Lange <i>Magydaris pastinacea</i> (Lam.) Paol (MP-API-017 H)	NE Morocco: Fafra, فافرة ; Fafra d'yal 'am, فافرة ديال عام (Fafra d'un an après un an, il meurt) ; Fafra d'yal 7 snine, فافرة ديال 7 سنين (Les Fafra de sept ans ne meurent pas). Ibn Al-Baytar: Ouchtorghâr أشرغار	General and unspecified (A)	5	4	0
Digestive (D)	3			3	0		
Eye (F)	3			0	0		
Musculoskeletal (L)	2			0	0		
Neurological (N)	2			0	0		
Respiratory (R)	9			0	0		
Skin (S)	9			0	0		
Endocrine/Metabolic and Nutritional (T)	0			1	0		
Female Genital (X)	1			0	0		
<i>Petroselinum crispum</i> (Mill.) (MP-API-018 JHN)	NE Morocco: Ma'dnous, المعدنوس Ibn Al-Baytar: Betrasalinon بطراسالينون Kerefes كرفس Maqdounes مقدونس ; Kerefes maqdouni كرفس مقدوني.			General and unspecified (A)	1	4	0
		Blood, Blood forming, Organs and immune mechanism (B)	0	1	1		
		Digestive (D)	2	12	0		
		Musculoskeletal (L)	1	0	1		
		Neurological (N)	0	0	1		
		Respiratory (R)	0	2	0		
		Skin (S)	0	3	0		
		Endocrine/Metabolic and Nutritional (T)	0	1	0		
		Urological (U)	3	4	1		
		Pregnancy, childbearing, Family Planning (W)	0	0	1		
		Female Genital (X)	1	2	0		
		Male Genital (Y)	0	1	0		
		<i>Petroselinum crispum</i> subsp. <i>Crispum</i> (MP-API-019 H)	NE Morocco: Imzzi, إمزي ⊠⊠⊠⊠	Urological (U)	0	0	1
<i>Pimpinella anisum</i> L. (MP-API-020 JHN)	NE Morocco: Habbat-Hlaoua, حبة حلاوة Ibn Al-Baytar: Anison أنيسون Habba Haloua حبة حلوة, Raziânedj roumi رازيانج رومي Kemoun halou كمون حلو	General and unspecified (A)	7	10	0		
		Blood, Blood forming, Organs and immune mechanism (B)	0	2	0		
		Digestive (D)	1	7	1		
		Eye (F)	0	1	0		

		Ear (H)	0	1	0
		Cardiovascular (K)	0	1	0
		Neurological (N)	1	1	0
		Psychological (P)	1	0	1
		Respiratory (R)	0	3	1
		Skin (S)	0	2	0
		Endocrine/Metabolic and Nutritional (T)	1	1	1
		Urological (U)	1	1	0
		Pregnancy, childbearing, Family Planning (W)	1	0	0
		Female Genital (X)	0	1	1
<i>Ridolfia segestum</i> (L.) Moris (MP-API-021 H)	NE Morocco: ربسباس Rbissbas ⊙⊙ξ⊙⊙.⊙. Ibn Al-Baytar: حزا Hizà ديناروية Dinârouya زوفرا zoufra.	General and unspecified (A)	0	3	0
		Digestive (D)	0	5	0
		Urological (U)	0	1	0