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# Evaluation of the Importance of Medicinal and Aromatic Plants used against Oral Pathology in the Meknes city through Determination of Quantitative Indices

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**Abstract**

A lot of research in different parts around the world took part in the registration of information in relationship with traditional medicine. To contribute to this important task, we have chosen to identify the most used medicinal and aromatic plants for the treatment of oral pathology.

In this optic, an ethnobotanical survey was carried out for 3 months in 2018 with using snowball sampling questionnaire among herbalists in Meknes city, Morocco. the database obtained allowed us to calculate the quantitative indices, such as Use Value (UV), Family UV (FUV), Fidelity Level and the Informant Consensus Factor (ICF), in order to assess the importance of plant species.

In total, 42 plant species were cited spread over 24 families.Juglandaceae family showed the highest significance (FUV = 0.78). 42 species are used for Periodontal diseases, 41 for microbial infections and only 16 for caries. *Origanum compactum* Benth. (UV = 0.88) was the most commonly prescribed by local herbalists, and the higher ICF (0.69) was registered for caries use.

**The study identified:**
24 plants families, 42 plant species
**Most cited plants are:**
*Origanum compactum* Benth.,
*Syzygium aromaticum* L.,
*Juglans regia* L.,
*Olea europaea* L.,
*Punica granatum* L.

**Keywords:** Oral pathology, Aromatic and Medicinal Plants, Quantitative indices, Meknes (Morocco).

## Introduction

The public health problems associated with oral disease are a serious burden on countries around the globe. [1]

Oral diseases such as dental caries, periodontal disease, tooth loss, oral mucosal lesions, oropharyngeal cancers and orodental trauma are major public health problems worldwide [2]; it poses distinct challenges when it comes to determine their microbial aetiology. Disease occurs at sites with a pre-existing natural and diverse microflora (dental plaque). [3]

However, Medicinal plants are of great importance to the health of individuals and communities [4]; according to the history of medicinal plants, the use of medicinal plants dates back to 5000 BC in China, 1600 BC by Syrians, Babylonians, Hebrews and Egyptians. [5]

While, Morocco is lucky to have such a varied climate that almost any medicinal plant can grow and be cultivated easily. [6]

Also, ethnomedicinal uses of plants by the local people today are often significant because it provides a gateway for the exploration of new drugs source from the herbal origin. [7]

In this context, the aim of this study is to determine the quantitative indices for different Plants used against dental diseases in Meknes city.

## Material and Methods

### Study area

Meknes city (latitude, 33˚53'36 "N, longitude 5˚32'50" W, altitude 548 m) [8] is located in the north of Morocco; it is an urban prefecture placed on a plateau in the northwest of Middle Atlas [9], and it covers a surface area about 178,700 Ha. [10]


Fig 1: Location map of Meknes city-Morocco [11]

### Data collection

Ethnobotanical data were collected from January to March 2018. All differences Information about medicinal plants used against oral affections were collected by carrying out a snowball sampling interviews with 50 traditional herbalists.

### Quantitative Analysis

The results of the ethnobotanical survey 12 were analyzed using the Use Value (UV), Family UV (FUV), Fidelity Level (FL) and Informant Consensus Factor (ICF).

Table 1: Indices used to describe medicinal plant knowledge

| Use value (UV) | Family UV (FUV) | Fidelity Level (FL) | Informant Consensus Factor (ICF) |
|---|---|---|---|
| The Use Value index (UV), was first proposed by Prance and *al.* [13], its value is important to be aware of the species known locally; it is based on the quotation by a given population. it is very used by the ethnobotanical community to indicate the species considered to be the most important. [14] | In ethnobotany, FUV can be calculated to find the value of biological plant taxon; it's a cultural importance index, and it can be calculated from the following formula: $FUV = \frac{UVs}{Ns}$ UVs = UV of the species | FL is used to determine the species most frequently used by respondents to treat a particular pathology. it is calculated using the following formula [17]: $FL = \frac{Np}{N} \times 100$ Np: is the number of uses for a given species to treat a particular disease | the purpose of this measure is to identify the level of agreement between herbalists on the medicinal species cited to treat a particular dental pathology. $ICF = \frac{Nur - Nt}{Nur - 1}$ Nur = Number of |

| | | | |
|---|---|---|---|
| It is calculated using the following formula:<br>$UV = \frac{Ui}{Ni}$<br>Ui: is the number of citations mentioned by each responder for a given plant Ni: is the total number of responders.<br>If Use Values are high that means that the plant is important, and if approach to zero (0) we cannot conclude if the plant is used for single or multiple purposes. [15] | and Ns = Total number of species in the family. [16] | N: is the total number of uses for any given species to cure dental affections. | citations for each particular disease and Nt = Number of species reported to cure that disease.<br>If the values are low (close to 0) it means that the plants are chosen at random or there is no exchange of information on their use between respondents and when it approachs to one (1) the plants will be well more defined in the community and the information is well exchanged between respondents. [18] |

**Results and Discussion**

**Study Points Distribution**

The results of data processing relating to the premises distribution of respondents are shown in Figure 2; As a result, Lahdim market and Skakine which is located in the old medina present 40% of all the surveyed herbalists; this is due to the massive concentration of these latest in one of the big and old souks in the city. Also, according to our interviews, we observed that traditional medicine and the culture of medicinal plants began from that place.

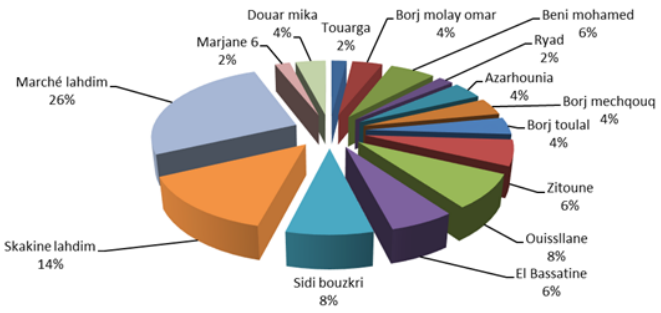


Fig 2: Distribution of 50 traditional herbalists in Meknes city

**Plant Species Used against Oral Pathologies and their quantitative indices**

Table 2: List of Medicinal and aromatic plants used by traditional herbalists for oral affections treatment

| Scientific Family | Scientific Name | Local Name /Plant English Name | CN | UV | FUV |
|---|---|---|---|---|---|
| Anacardiaceae | *Pistacia atlantica* Desf. | Labtam /Atlas pistachio | 6 | 0,12 | 0,12 |
| Apiaceae | *Ammi visnaga* L. | Lbachnikha / Khella | 16 | 0,32 | 0,14 |
| Apiaceae | *Foeniculum vulgare* P. Mill. | Nafaa / Fennel | 3 | 0,06 | |
| Apiaceae | *Pimpinella anisum* L. | Lyansoun / Green anise | 2 | 0,04 | |
| Apocynaceae | *Nerium oleander* L. | Dafla / Oleander | 6 | 0,12 | 0,12 |
| Asteraceae | *Artemisia herba alba* Asso. | Chih / White wormwood | 10 | 0,20 | 0,11 |
| Asteraceae | *Anacyclus pyrethrum* L. | Ikandaz / African pyrethrum | 5 | 0,10 | |
| Asteraceae | *Chamaemelum nobilis* L. | Elbabonj / Chamomile | 2 | 0,04 | |
| Brassicaceae | *Lepidium sativum* L. | Elharf or Hab rchad / Garden pepperwort | 1 | 0,02 | 0,02 |
| Capparaceae | *Capparis spinosa* L. | Al kabar / Common caper | 1 | 0,02 | 0,02 |
| Cupressaceae | *Tetraclinis articulata* (Vahl) Masters | Elaafs=Araar / Thuya | 12 | 0,24 | 0,24 |
| Fabaceae | *Glycyrrhiza glabra* L. | Aark sous / Licorice | 4 | 0,08 | 0,08 |
| Grossulariaceae | *Nigella sativa* L. | Elhaba sawda / Nigelle | 1 | 0,02 | 0,02 |
| Juglandaceae | *Juglans regia* L. | Swak / Walnut barks | 39 | 0,78 | 0,78 |
| Lamiaceae | *Origanum compactum* Benth. | Zaatar / Oregano | 44 | 0,88 | 0,14 |
| Lamiaceae | *Mentha pulegium* L. | Flio / Pouliot Mint | 7 | 0,14 | |
| Lamiaceae | *Thymus satureioides* Coss. | Zeitra / Thyme | 5 | 0,10 | |
| Lamiaceae | *Lavandula* sp. | Lakhzama / lavender | 4 | 0,08 | |
| Lamiaceae | *Majorana hortensis* Moench. | Mardadouch / Marjoram | 2 | 0,04 | |
| Lamiaceae | *Rosmarinus officinalis* L. | Azir / Rosemary | 2 | 0,04 | |
| Lamiaceae | *Salvia officinalis* L. | Salmia / Sage | 2 | 0,04 | |
| Lamiaceae | *Marrubium vulgare* L. | Mariwta / White horehound | 2 | 0,04 | |
| Lamiaceae | *Mentha spicata* L. | Naanaa / Mint | 1 | 0,02 | |
| Lamiaceae | *Teucrium Polium* L. | Jeidiya / Pennyroyal | 1 | 0,02 | |
| Lauraceae | *Cinnamomum burmannii* (Nees & T. Nees) Blume | Elkarfa / Cinnamon | 1 | 0,02 | 0,02 |
| Lauraceae | *Laurus nobilis* L. | Waraq sidna moussa / Laurel sauce | 1 | 0,02 | |
| Linaceae | *Linum usitatissimum* L. | Zariaat al katan / Linseed | 1 | 0,02 | 0,02 |
| Lythraceae | *Punica granatum* L. | Kchour roman / Pomegranate peel | 24 | 0,48 | 0,48 |

| | | | | | |
|---|---|---|---|---|---|
| Mimosaceae | *Acacia raddiana* Savi | Esalaha=Talh / Acacia | 4 | 0,08 | 0,08 |
| Myrtaceae | *Syzygium aromaticum* L. | Lakranfal / Clove | 41 | 0,82 | 0,40 |
| Myrtaceae | *Myrtus communis* L. | Rayhan / Myrtle | 17 | 0,34 | |
| Myrtaceae | *Eucalyptus* sp. | Lkalibtous / Eucalyptus | 2 | 0,04 | |
| Oleaceae | *Olea europaea* L. | Zaytoun bari / Oleaster | 26 | 0,52 | 0,52 |
| Rosaceae | *Malus domestica* Borkh. | Atafah / Apple | 1 | 0,02 | 0,02 |
| Rosaceae | *Rosa Damascena* Mill. | Lward lfilali / Damascus rose | 1 | 0,02 | |
| Rutaceae | *Citrus limonum* L. | Alaymoun / Lemon | 2 | 0,04 | 0,04 |
| Salicaceae | *Salix alba* L. | Waraq safsaf / White willow | 1 | 0,02 | 0,02 |
| Salvadoraceae | *Salvadora persica* L. | Oud arak / Wood of araq | 7 | 0,14 | 0,14 |
| Theaceae | *Camellia sinensis* L. | Hboub atay / Green tea | 12 | 0,24 | 0,24 |
| Zingiberaceae | *Alpinia officinarum* Hance | Elkhodanjal / Galanga officinal | 1 | 0,02 | 0,02 |
| Zingiberaceae | *Curcuma longa* L. | Al kharkoum / Turmeric | 1 | 0,02 | |
| Zygophyllaceae | *Peganum harmala* L. | Elharmal / Harmal | 2 | 0,04 | 0,04 |

**CN: number of informants who cited a given plant species, UV: use value, FUV: family use value**

The UV of the cited plants ranged between lowest value 0.02 and highest value 0.88. The highest UV was obtained for the *Origanum compactum* Benth. (0.88) followed by *Syzygium aromaticum* L. (0.82) then *Juglans regia* L. (0.78), *Olea europaea* L. (0.52) and *Punica granatum* L. (0.48).

The FUV ranged between (0.02) and (0.78). The highest FUV was registered for Juglandaceae family (0.78), followed by Oleaceae with (0.52), Lythraceae with (0.48), Myrtaceae (0.40), Cupressaceae and Theaceae (0.24) **(Table 2).**

According to these high values of UV and FUV, we can conclude that these plants are the most used for a long time against different oral diseases. This is really interesting in the sense to the valorization of these natural species, without forgetting that these plants have been the subject of a lot of research concerning their biological activities and their chemical importance which offers the the opportunity to bio-active alternative molecules.

Also, related to some bibliographic researches about the use of the plants most frequently found in this investigation at the level of the teeth, we note that *Origanum compactum* Benth., contains Thymol, Carvacrol. [19] Recently, Khan and *al.* [20] reported that carvacrol and thymol have an effect against cariogenic bacteria; Guessous 2013 [21] found that *Syzygium aromaticum* L. is used in periodontal disease: gingival swelling (77.7%), bad breath (63.1%) and gum bleeding (75.7%). It has also been reported that this plant contains Eugenol [22], and had shown a potent antimicrobial and antibiofilm property due to the presence of this compound. [23] Moreover, Eugenol successfully exhibited modest antiadhesive and antibiofilm properties of *Streptococcus mutans* when it is used to cover the cotton suture surface also. [24]

Due to its antimicrobial, antifungal, antiseptic, astringent, hemostatic, keratinizing and healing effects, *Juglans regia* L. can improve oral hygiene, prevents the formation of plaques and caries, reduces the incidence of gingival and periodontal infections. [25] In fact, *Juglans regia* contains chemicals compounds as ascorbic acid, juglone, folic acid,

gallic acid ; also, regiolone is reported to be responsible for antibacterial, antioxidant, and antifungal activities of this plant. [26,27]

Finally, it has been reported that *Olea europaea* L. and *Punica granatum* L. are used against tooth diseases: aphtes, haemorrhage, gingivitis, genital herpes, halitosis, stomatitis ; [28] in addition to that, *Olea europaea* L. contains oleuropein [29] which had been reported to have strong antimicrobial activity. [30,31]

**Table 3:** Most frequently used plants for different pathology based on highest FL (%) (Total informants=50)

| Botanical name | Pathology | Citation for particular disease | Fidelity Level (%) |
|---|---|---|---|
| *Origanum compactum* Benth. | Periodontal diseases | 46 | 92 |
| *Juglans regia* L. | | 39 | 78 |
| *Olea europaea* L. | | 26 | 52 |
| *Punica granatum* L. | | 24 | 48 |
| *Origanum compactum* Benth. | Microbial infections | 45 | 90 |
| *Juglans regia* L. | | 38 | 76 |
| *Olea europaea* L. | | 24 | 48 |
| *Punica granatum* L. | | 24 | 48 |
| *Juglans regia* L. | Caries | 30 | 60 |
| *Origanum compactum* Benth. | | 16 | 32 |
| *Ammi visnaga* L. | | 14 | 7 |
| *Pistacia atlantica* Desf. | | 12 | 6 |

The highest Fidelity Level was recorded with four species against Periodontal Diseases: *Origanum compactum* Benth. (92%), *Juglans regia* L. (78%), *Olea europaea* L. (52%) and *Punica granatum* L. (48%), respectively. *Origanum compactum* Benth. presents a FL of (90%), *Juglans regia* L. (76%), *Olea europaea* L. and *Punica granatum* L. (48%) against microbial infections; for caries, four species posseded the highest FL :(60%) for *Juglans regia* L., (32%) for *Origanum compactum* Benth., (14%) for *Ammi visnaga* L. and (12%) for *Pistacia atlantica* Desf. **(Table 3).**

The high FL of a species indicates his frequency of use and the prevalence of a specific disease in an area by the inhabitants to treat it by specific specie. [32,33]

**Table 4:** Informant Consensus Factor (ICF) for each pathology

| Pathology | Number of taxa (Nur) | Number of use report (Nt) | Consensus factor ICF |
|---|---|---|---|
| Periodontal diseases | 50 | 42 | 0,16 |
| Microbial infections | 50 | 41 | 0,18 |
| Caries | 49 | 16 | 0,69 |

According to **table 4** , ICF values obtained from different pathologies have been reported, namely, periodontal disease, microbial infections and caries. These ICF values indicate the degree of shared knowledge of medicinal species uses. They ranged between 0.16 to 0.69 per disease. The highest value of ICF (0.69) was recorded at the level of caries with 16 species.

High ICF values also indicate that the species traditionally used to treat these ailments are worth searching for bioactive compounds. The least agreement (ICF=0.16) between the informants was observed for plants used to cure periodontal disease. The low ICF value as recorded in our study could be due to a lack of communication among people in different areas.

**Conclusion**

This ethnobotanical study among herbalists operating traditional medicine in Meknes reveals the role and the importance of plants used to cure dental diseases in the city. The collected data can help to translate the traditional practices to oriented scientific research in dentistry. Also, these results highlight the value of traditional dental

phytotherapy in the treatment of certain oral diseases, including gum disease and microbial infections.

This can help us to think about some alternative molecules based on medicinal plants that have an oral effect, especially in our country where traditional practices and traditional medicine are still very wide used, especially in rural areas where health centers and hospitals are rare or far from population.

As a result, we should do further studies in this direction in order to enhance our natural and endemic patrimony, as well to go out with scientific recommendations in order to translate traditional flavors to scientific knowledge.

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