Ethnobotanical treatment of oral diseases in the highland region of Setif (Northeast Algeria)

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Research

Abstract

Background: Oral diseases are a major health problem for many countries and affect people throughout their lifetime, causing pain, discomfort, disfigurement and even death. They are, to a large extent, preventable. So it is one of the diseases that have been treated by well accepted therapies involving herbal remedies.

Methods: A series of ethnobotanical surveys were carried out using 368 questionnaire sheets in the region of Sétif with herbalists, rural populations and patients**,** to identify the medicinal plants most requested for the treatment of the most common oral pathologies. Information was divided into two parts. The first is about the herbalist as the sole owner of the information, and the second is about collecting information about medicinal plants.

Results: A total of 141 plant species belonging to 60 families have been identified. The results showed that 81 plant species were used for gum diseases, 74 for toothache, 35 for bad odour from the mouth and 53 for oral ulcers. The most recommended species by local herbalists and rural communities were *Syzygium aromaticum* (UV = 0.94), *Juglans regia* (UV = 0.91) and *Salvadora persica* (UV = 0.84).

Conclusions: The findings suggest that the use of medicinal plants in Setif is closely associated with the demographic characteristics of the respondents, such as sex, age, education level, and marital status. Analyzing the collected data could help transition from prevalent oral traditions to documented knowledge. This transition not only preserves valuable cultural practices but also improves understanding of local biodiversity and its potential applications in modern medicine. By documenting this knowledge, future generations can benefit from both the historical significance and the therapeutic properties of these plants.

Keywords: Ethnobotany, Medicinal plants, Oral diseases, Setif, *Syzygium aromaticum*

Background

Dental health issues can lead to various negative effects on overall wellness and reduce quality of life. Therefore, dental health is a crucial aspect of general health (Watt 2005, Bramantoro *et al.* 2020). The World Health Organization (WHO) indicates that oral diseases represent a significant global health challenge in the 21st century, ranking as the third most considerable burden worldwide, following cardiovascular diseases and cancer (Petersen 2009; Mak & Day, 2011; Harouak *et al.* 2018). Oral diseases continue to be a major public health concern in high-income countries and are on the rise in many low- and middle-income countries (Petersen *et al.* 2005). The most common problems are dental caries, periodontal disease, oral cancers, and injuries to the pharyngeal and oral tissues (Palombo 2011). As a result, these diseases impact all segments of society and remain a significant source of health issues, closely linked to barriers in accessing healthcare as well as socio-economic, cultural, and environmental factors (Ameziane *et al.* 2014).

Treating oral health problems can be costly, and universal health care (UHC) often does not cover these expenses. As a result, many low- and middle-income countries struggle to provide preventive and therapeutic services for these issues. In contrast, the exploration of botanical resources in conventional medicine presents a valuable alternative due to their effectiveness and affordability. Recently, there has been a growing interest in natural compounds for their potential medicinal properties (Majdoub *et al.* 2022). Plant substances are being proposed as alternative treatments for oral and dental diseases, with long-term effectiveness being a crucial consideration. Future healthcare professionals will need to integrate traditional knowledge, refine it, and incorporate it into existing medical practices for the overall benefit of the community (Cruz Martínez *et al.* 2017). These botanical resources demonstrate significant antibacterial properties and are generally safe, although they may occasionally cause side effects and do not contribute to resistance phenomena (Boonyanit *et al.* 2011; Takahashi & Nyvad 2011). In dentistry, the botanical characteristics utilized in conventional medicine are explored for alleviating dental pain, gum inflammation, and conditions such as canker sores or aphthous ulcers (Kumar *et al.* 2013). Several extracts are recognized for their anti-inflammatory effects and ability to inhibit bleeding, making them essential in dental therapy (Taheri *et al.* 2011). Reports indicate that these plants possess various properties, including antiseptic, antibacterial, antimicrobial, antifungal, antioxidant, antiviral, and analgesic actions (Sinha & Sinha 2014).

Algeria is a significant reservoir of phytogenetic resources, boasting an abundant and diversified flora. It is ranked among Mediterranean countries known for their important medical traditions and rich knowledge of medicinal plants (Rebbas *et al.* 2012). Consequently, medicinal plants are integral to Algerian culture and play an essential role in public health, which necessitates further study, characterization, and protection. One notable example is "Miswak," scientifically known as *Salvadora persica*, widely used by the Algerian population for preventing oral issues, treating gum inflammation, and addressing skin irritations and hair problems (Aissi & Boudjelal 2014).

Historically, these natural remedies served as the primary form of medicine for our ancestors. Despite the advancements in the pharmaceutical industry and its significant contributions to treating various diseases, the use of medicinal plants and remedies has persisted (Chermat & Gharzouli 2015). Recently, there has been a growing interest in this ancestral knowledge, traditions, and expertise, which are largely transmitted orally and are currently held by a limited number of individuals, many of whom are illiterate. Furthermore, younger generations rarely receive this knowledge, as they often show little interest in anything related to nature (Meddour *et al.* 2009).

Thus, it is crucial to swiftly collect ethnobotanical and particularly ethnomedicinal information to create a comprehensive inventory of plants currently utilized by rural communities. Recently, significant attention has been directed toward preserving this knowledge, with the challenge now being to conserve and develop these natural resources while also safeguarding this cultural heritage (Rebbas *et al.* 2012). Although several studies have indicated that the use of medicinal plants remains widespread in Algerian society, there has been limited focus on traditional medicine, particularly herbal treatments for oral diseases in the highland regions of Setif. This area serves as an ideal site for studying plant species and their traditional uses, due to its wealth of natural and cultural resources, as well as its unique location and socio-economic context (Miara *et al.* 2019).

The present study aimed to conduct an ethnobotanical survey in the Setif region to establish a list of the medicinal plants most commonly used by local populations for treating oral diseases. The study also aimed to gather data on the therapeutic practices in the region. This research will help identify plant species that could be the focus of further studies to confirm their safe use in dentistry. It will also pave the way for additional research into the in vitro biological activities of the most frequently cited plants used for oral diseases within the community (Santos *et al.* 2009).

Materials and Methods

Study area

The wilaya of Sétif is part of the high Constantine plains of northeastern Algeria (Quezel & Santa 1962-63). It is located in the region of the high lands and covers an estimated area of 6,549.64 km2. Sétif is distant from the Capital Algiers of 300 km, and rises to 1100 meters of altitude. It occupies a predominant position among the wilayas of the eastern highlands. It is surrounded by the wilayas of Bejaia and Jijel to the north, the wilayas of M'sila and Batna to the south, the wilaya of Mila to the east and the wilaya of Bordj-Bou-Arréridj to the west (Fig.1). Many factors intervene to determine the climate of the wilaya of Setif, and which are: The altitude estimated at 1100 m; the distance of 100 km from the Mediterranean Sea and its location on the high plateaus of the East and the fact that it is surrounded by mountains. The combination of these factors makes that the wilaya of Setif enjoys a continental climate semi-arid characterized by hot and dry summers and rainy and cold winters (ANDI 2013). Rainfall is insufficient and irregular both in time and space. If the Babors Mountains are the most watered, receiving more than 700 mm per year, the amount decreases significantly to reach 400 mm on average per year on the high plains, but the southern plains, on the other hand, receives the least rainfall, with annual rainfall barely exceeding 300 mm (Djenba 2015). From the thermal point of view, the accentuation of the contrasts is noticed; the temperatures are low in winter and high during the summer period (Ali-Khodja 2015).

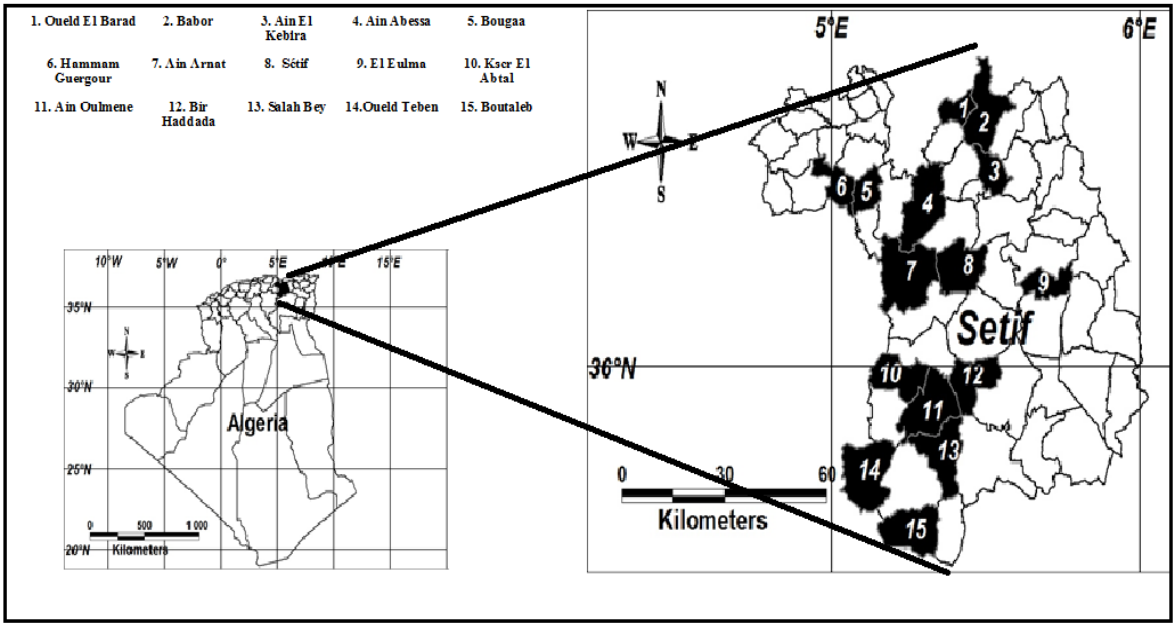


Figure 1. The Survey area (Map Info 9.00, made by author)

Interviews and survey

The location of the survey sites was determined by their proximity to the mountainous areas surrounding the city of Setif and the number of individuals knowledgeable about existing medicinal plants. The survey was conducted among herbalists, traditional practitioners, and the rural population across fifteen localities (Fig. 01). The town of Oued El Barad is located 43.8 km northeast of Setif. Babor is situated in the extreme north of the Wilaya of Sétif, within the mountainous region of Babors in the small Kabylie, bordering the Wilaya of Jijel and Ain el Kbira, which is located 28 km northeast of Setif. Aïn Abessa is located 18 km northwest of Setif. The city of Bougaa is positioned 45 km northwest of Setif and 80 km south of Bejaia. Hammam Guergour, a mountainous town, lies between the Babors and the High Plateaux, while Aïn Arnat is located 7 km west of Setif. The city of Setif is centrally located within the Wilaya. El Eulma is situated 26 km east of Setif and 97 km west of Constantine. Kaser El Abtal, located 33 km southeast of Setif, was included due to its proximity to Djebel Zdimm, which boasts notable biodiversity concerning medicinal plants. Ain Oulmane is 37 km south of Setif, while Bir Haddada is located 58.8 km south. Salah Bey, located 43 km southeast, and Oueld Teben, 67.9 km to the south, are distinguished by forests amid the mountains and their closeness to the Hodna Mountains. Additionally, Boutaleb, at an altitude of 860 meters and near the Aures, experiences a dry semi-arid climate with very cold winters. A questionnaire was administered to herbalists through face-to-face interviews (Mehdioui & Kahouadji 2007). Ethnobotanical data were collected from September 2019 to March 2020 through semi-structured interviews with 368 traditional herbal practitioners regarding the therapeutic use of flora. Participants were selected by convenience sampling. Prior to each interview, the study objectives were explained, and researchers obtained oral informed consent, ensuring that participation was voluntary. The researchers anonymized

responses by assigning each informant a code in the database. The study adhered to the ethical principles outlined in the International Society of Ethnobiology Code of Ethics. Eligibility criteria included herbalists who provide advice on botanical remedies for dental and oral issues, while those who only sold medicinal plants or did not prescribe for oral problems were excluded. All herbalists in their shops were approached. The survey aimed to gather information on participant characteristics, including sex, age, education level, and sources of knowledge regarding oral health; flora used in treating oral pathology, with questions addressing common names, customary uses, active constituents, preparation methods, modes of administration, dosages, plant classifications, and costs; and user profiles (patients), collecting data on the age, sex, and marital status of patients utilizing herbal remedies for oral issues based on the advice of traditional herbal practitioners (Zougagh *et al.* 2019). The identity of each plant species cited by herbalists was validated and corroborated by departmental botanists and various sources (Quezel & Santa, 1962-1963; Ozenda, 1977; Dobignard & Chatelain, 2010-2013), in addition the scientific names of all medicinal plant species recorded during the ethnobotanical survey were taxonomically verified using the Plants of the World Online (POWO) database (Royal Botanic Gardens, Kew). The accepted names, botanical author citations, synonyms, and family assignments were checked and updated according to the current taxonomic information available in the database. Previously used synonyms and outdated nomenclature were replaced with currently accepted scientific names wherever necessary.Voucher specimens were confirmed and deposited in the herbarium of the Laboratory of Botany at the University Mohamed Boudiaf, M'sila, Algeria. A therapeutic application was considered a reported traditional medicinal use when it was mentioned by at least three respondents. This criterion was established to identify medicinal plant uses reported by multiple informants and to document shared traditional knowledge within the surveyed communities. It should not be interpreted as evidence of therapeutic efficacy or clinical benefit (AlQuran 2009).

Informants consensus factor (ICF) and use-value (UV) of plant species

Various quantitative indicators were calculated from the collected data. Includes use value (UV), Fidelity level (FL) and Informant Consensus Factor (ICF).

Use value (UV)

The use value was calculated to determine the level of use of each species in the study area. It was calculated using the following formula:

$$U = \Sigma U/N$$

Where: U Number of use reports cited by each informant for a given species and N total number of informants.
Utilization values are high when there are many utilization reports for a plant and approach zero (0) when there are few reports of its use.

Fidelity level (FL)

The Fidelity Level (FL) was calculated to determine the relative importance of a medicinal plant species for treating a particular disease or therapeutic indication, based on the proportion of informants who reported using that species for the same specific purpose. The FL was calculated according to the following formula:

$$FL(\%) = (Np / N) \times 100$$

Where: NP number of informants claiming the use of a plant species to treat a particular illness category and Number of informants who use plants as medicine to treat any illness category.

Informant Consensus Factor (ICF)

This index was calculated for each disease classification to determine the degree of concordance among participants for the medicinal flora used to treat a particular disease. The ICF was calculated with the following equation:

$$ICF = (Nur - Nt) /(Nur -1)$$

Where: Nur= Number of citations for each particular disease and Nt = Number of species reported to cure that disease.

Results and Discussion

Sociodemographic characteristics of informants

Sex

In the study area, it has been found that both men and women are involved in traditional medicine. However, most of the interviewees that mention the use of plants in the treatment of oral diseases are women (69.02% versus 30.98%) (Table1). This explains the fact that women are more concerned with phytotherapeutic treatment and preparation of plant-based recipes, not only for themselves but also for the entire family, especially for their children. Furthermore, it can be justified by the representativeness of women in the family health (Vieira *et al.* 2014). Much of the knowledge of indigenous females in ethnobotanical studies has been ignored because of a focus on male experts (Howard 2003; Pfeiffer & Butz 2005). Many studies have demonstrated this. Although women are often more knowledgeable than men in identifying and using medicinal plants, their knowledge may be epistemologically different (Howard 2003). Until recently, most ethnographers have been men, restricting their ability to collect women's knowledge in cultures where men have more access to the public sphere than women (Pfeiffer & Butz 2005). These factors are especially significant in the global performance of ethnobotanical studies. Ethnobotanical investigations have neglected women in urban settings regardless of the fact that women are the main users of medicinal plants (Eloemy & AlBedah 2012). The results obtained are in accordance with other ethnopharmacological studies (Lima Júnior *et al.* 2005; Borba & Macedo 2006; Santos *et al.* 2009). These results were also in accordance with other ethnobotanical studies carried out at the national level including the work of Aribi (2013) in the Jijel region in northern Algeria, where most of the respondents indicating the use of plants for the treatment of oral disease were women (68% versus 32%). Ethnobotanists have traditionally been overwhelmingly male, limiting their access to women's knowledge in cultures where men have greater access to the public than women (Pfeiffer & Butz 2005). These factors are particularly important in ethnobotanical research conducted across the globe (Elolemy *et al.* 2012). Urban women are important consumers of medicinal herbs but have not been studied from an ethnobotanical perspective.

Table 1. Sociodemographic characteristics of informants

Biodata	**Frequency**	**Percentage (%)**
Sex		
Female	254	69.02
Male	114	30.98
Age		
20-29	33	8.97
30-39	66	17.93
40-49	78	21.20
50-60	85	23.10
> 60	106	28.80
Academic level		
Illiterate	80	21.74
Primary	89	24.20
College	76	20.65
Secondary	50	13.57
Academic	73	19.84
Marital status		
Single	120	32.61
Married	187	50.81
Widowed	47	12.77
Divorced	14	3.80

Age

The use of medicinal plants is widespread among all age group; participants in the age group over 60 years have more knowledge of medicinal plants than other age groups, with a frequency of use (28.80%). However, for the age groups 50 to 59, 40 to 49 and 30 to 39, we note an almost balanced average rate of 23.10%, 21.20% and 17.93% respectively. On the other hand, people in the 20 to 29 age group are the least represented with only 8.97% (Table 1). This implies that the aged are the custodians of traditional wisdom. This thus poses a major threat to indigenous knowledge as it risks being wiped out with the passing of the elder generation. This finding is consistent with the findings provided by Kankara *et al.* (2015). It suggests that the legacy of the use of traditional medicines for oral lesions may be diminished if timely measures are not

taken to include them in oral health education and promotional initiatives (Chonco 1972). The results thus obtained are compatible with other ethnopharmacological studies (Ranjarisoa *et al.* 2016; Miara *et al.* 2019, Bencheikh *et al.* 2021). This last result confirms the neglect of the new generation to the natural heritage while the world is converging towards phytotherapy. According to Anyinam (1995), knowledge of the uses and the properties of medicinal plants are generally acquired with age and with long experience transmitted from one generation to another. The transmission of this knowledge is currently in danger because it is not always assured. This confirms the results obtained, which show that people who belong to the age group of over 60 years have more knowledge of medicinal plants than other age groups. Therefore, the experience accumulated with age is the main source of information at the local level about the use of plants in traditional medicine. To our knowledge, this is the first study to deal with (368 herbalist) a larger number than suggested in preceding ethnopharmacological investigations accomplished in Algeria. For example, Boudjelal *et al.* (2013) had been capable of interview eighty three herbalist's with inside the Msila region, at the same time as in Mascara, Benarba *et al.* (2015) interviewed forty three conventional healers. Similarly, Ouelbani *et al.* (2016) interviewed forty five herbalists with inside the Constantine region. In a recent investigation, Bencheikh *et al.* (2021) carried out interviews with 488 local informants, consisting of 476 non-experts and 12 herbal health practitioners in "Inventory of medicinal plants utilised traditionally for the treatment of kidney ailments in North-Eastern Morocco." The results obtained are consistent with Friedman *et al.* who affirm that women have more knowledge of medicinal plants and these differences can be justified by cultural and professional differences. In contrast, a study (Chekole 2017) showed that the most engaged participants were male who did their activities outside their houses. Thus, they may have the opportunity to gain the advantageous traits of plant species through routine encounters. Healers also favoured giving information regarding their indigenous medicinal flora, assuming that only men could transport plant species to far distant areas and forests. The predominance of males has also been reported by other scholars in the study of conventional medicinal flora (Kidane *et al.* 2014; Balde *et al.* 2015).

Academic level

In the study area, the vast majority of users of medicinal plants are people with a primary level, with a rate of 24.20%. While illiterate people, college school, and academic level have a percentage of use of medicinal plants slightly less compared to the previous ones (21.74%, 20.65% and 19.84% respectively). While those with secondary school level, use very little medicinal plants (13.57%) (Table 1). These results confirm the results obtained by Orch *et al.* (2015) which shows that medicinal plants are much more used by illiterate people or had a primary school level and furthermore confirms the fact reported by Zougagh *et al.* (2018), with 38.92%, 26.35%, 23.95% and 10.78 respectively for informal people, primary schooling, secondary schooling graduate levels people. In addition to the need to travel to urban centers for access to health care, the lack of financial resources and the high costs of modern medical care for oral diseases prevent the pursuit of modern medicine, and are factors that drive people to choose traditional remedies in the locality under study (Bencheikh *et al.* 2021).

Marital status

The use of medicinal plants by married people represents 50.81%. Then single people (32.61%) forwarded by widows (12.77%). On the other hand, divorced people represent only 3.80% (Table 1). These results may be explained by the fact that married people are responsible as parents for providing primary care therapy for the theire entire family.

Origin of information and the choice between herbal medicine and modern medicine

The uses of medicinal plants according to the origin of information are reported in Fig. 2. The results obtained show that 51.09% of the population referred to the experiences of others or their predecessors (parents, neighbors and friends) to use medicinal plants as remedies for specific diseases. This reflects the picture of relative transmission of traditional practices from one generation to another. While 13.86% of the population referred to herbalists or healers. On the other hand, 23.64% of the people referred to themselves by consulting books on herbal medicine or through television programs and 11.41% referring to other sources of information based on their own experience through the existence of many medicinal plants in their surroundings. Most people and traditional healers get their knowledge of traditional medicine from their ancestors or elders, and such knowledge is transmitted orally and learned through observation of the preparation and application of herbal remedies (Malik *et al.* 2019; Harbane *et al.* 2022). This ancestral wisdom of phytotherapy, passed down through generations, is in risk of disappearing without intervention. (Sargin *et al.* 2015; Bencheikh *et al.* 2021). Regarding therapeutic practices, 42.39% of the population use traditional medicine, 35.33% use modern medicine and 22.28% use both (Fig. 2). This is substantiated by the local populace's interest in conventional medicines for alleviating their everyday diseases, which are predominantly passed down from their forebears. Guedje *et al* (2010) assert that the selection of herbal remedies by local communities is frequently linked to the seclusion of rural regions, the absence or primitive condition of healthcare facilities, the exorbitant prices of pharmaceuticals, and the limited financial resources of the populace. Algeria possesses a vast array of medicinal plants, and its populace continues to depend on traditional medicine for accessible and cost-effective

phytotherapy (Harbane *et al.* 2022). Conventional folk wisdom must be integrated into contemporary oncological frameworks globally to enhance patients' engagement in complementary and alternative medicine practices and self-treatment (Büntzel *et al.* 2021).

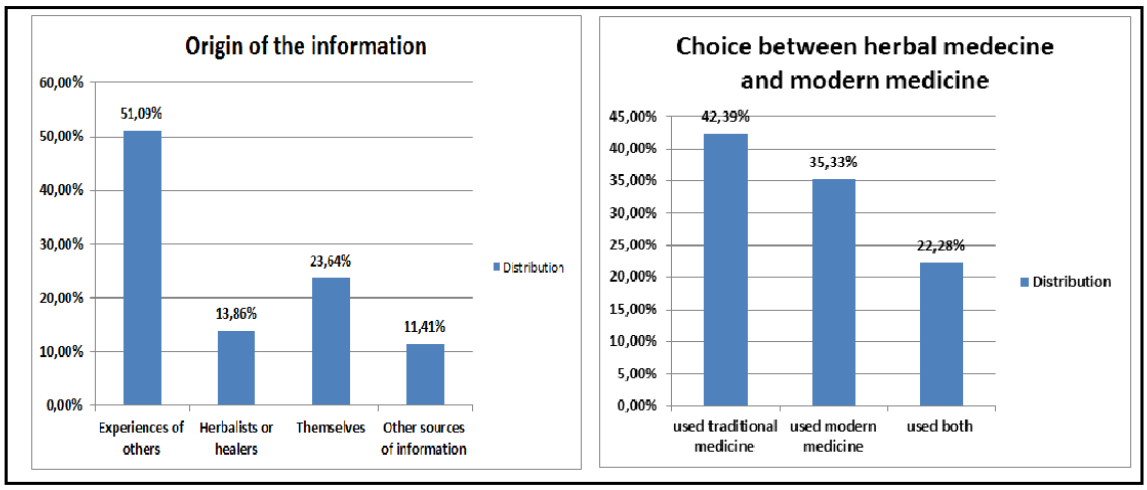


Figure. 2 Distribution of medicinal plant users; Origin of information and the choice between herbal medicine and modern medicine

Medicinal plants used for the treatment of oral desases

Botanical diversity

The overall results about botanical diversity are summarized in Table 2. The results of the ethnobotanical survey carried out in the study regions allowed us to draw up a list of 141medicinal plants, divided into 60 botanical families, the most represented are the Lamiaceae (22 species), the Asteraceae (16 species), the Rosaceae (9 species), the Apiaceae (7 species) and the other families are present with 1 to 3 species. Similarly, Anam *et al.* (2018) reported 72 plant species and 56 genera belonging to 38 plant groups used for the treatment of oral ailments. The most common family, life form and plant part used were Asteraceae (6 species), herbs (30 instances) and leaves (22 instances) respectively (Anam *et al.* 2018). However, a number of studies have shown that Asteraceae was the most frequently cited plant family which is in accordance with its dominance in several previous ethnobotanical studies conducted in Pakistan and other parts of the world (Mosaddegh *et al.* 2012; Polat & Satıl 2012; Kayani *et al.* 2015). This shows that the medicinal plants used are not concentrated in only a few families and genera. As well as these results confirm previous studies conducted at the region of Tizi Ouzou (Meddour & Meddour-Sahar 2015), which identified 98 medicinal plants divided into 49 families whose most represented families are: Lamiaceae (13 species), Asteraceae (12 species) and Rosaceae (6 species). Likewise, in further ethnobotany experiments, it has been established the abundance of more medicinal plants species of the Asteraceae family (Lamorde et al., 2010; Agarwal & Varma 2012; Gebeyehu *et al.* 2014). The abundance of medicinal plant species of family Lamiaceae may be explained by the adaptation capacity of the family species in different altitudes in the study area. The variety of plant species acquired correlates with the extent of knowledge and use of these plants by the Adrar community, in addition to our focus on traditional practitioners and plant consumers (Hassaïne *et al.* 2022). The Lamiaceae family predominated in various local studies carried out in Msila, Bordj Bouarriridj, and Ouergla (Madani *et al.* 2012; Telli *et al.* 2016; Miara *et al.* 2019), as well as in the Mediterranean area (Benítez 2010). This can be elucidated by the observation that this family has some of the most therapeutic species (Benítez 2010) alongside the abundant flora of the region, which includes species from the Lamiaceae (Telli *et al.* 2016). Furthermore, the variety of plant species acquired is likely connected to the extent of understanding and applications of the plants by the community, in addition to our focus on traditional practitioners and plant consumers (Hassaïne et al., 2022).

Table 2. List of Medicinal plants used for the treatment of oral pathology oral desases prescribed by traditional herbalists in Setif region

Family scientific Scientific name [Voucher specimen No]	**Vernacular name**	**Part used**	**Mode of Preparation**	**Route of administration**	**Traditional therapeutic effect**	**CN**	**UV**
Adoxaceae *Sambucus ebulus* L. [MS- 30]	Khelouan	Leaves/Flower/ Fruits	Infusion	Mouthwash	GD	29	0.08
Aloaceae *Aloe vera* (L.) Burm. f. [MS- 21]	Al sabar	Leaves	The Gel	Mouthwash	OrU, GD	94	0.25
Anacardiaceae *Pistacia lentiscus* L. [MS - 101]	Drou	Leaves/ Flower	Decoction	Mouthwash	GD, OrU, OI	76	0.20
Apiaceae *Ammi visnaga* (L.) Lam. [MS - 102]	Noukha	Fruits / Leaves	Decoction/ Raw	Mouthwash / Direct application	H, GD, DP	54	0.14
Apium graveolens L. [MS - 103]	Kerafs	Leaves / Stems	Raw	Mastication	DP, OI, H	42	0.11
Coriandrum sativum L. [MS - 22]	Kousbor	Leaves	Raw	Mastication	DP, H	32	0.09
Cuminum cyminum L. [MS - 104]	kammun	Leaves /Seeds	Decoction	Mouthwash	DP, GD	38	0.10
Anisosciadium lanatum Boiss. [MS - 105]	El besbas	Leaves /Seeds	Decoction / Raw	Mouthwash / Mastication	H, DP, GD	47	0.13
Petroselinum crispum (Mill.) Fuss. [MS - 23]	Maàdnous	Leaves	Raw	Mastication	H, DP	40	0.11
Pimpinella anisum L. [MS - 106]	Habet hlâwa / Yansoun	Seeds	Decoction /Infusion	Mouthwash	GD, H	32	0.08
Apocynaceae *Nerium oleander* L. [MS - 31]	Defla	Leaves /Roots	Raw /Cataplasm	Mouthwash / Direct Application	H, GD, DP	58	0.16
Vinca difformis Pourr. [MS - 24]	El Kadab	Tiges / Leaves	Decoction / Infusion	Mouthwash	GD, OrU	24	0.06
Arecaceae *Cocos nucifera* L. [MS - 107]	Djuz alhind	Fruits	Essential Oils	Mouthwash / Direct Application	H, GD, OrU, TD	84	0.23
Phoenix dactylifera L. [MS - 25]	Tmar	Fruits	Raw / Decoction	Mouthwash / Direct Application	GD	64	0.17

Aristolochiaceae *Aristolochia fontanesii* Boiss. & Reut. [MS - 26]	Belrostom	Roots	Decoction	Mouthwash	GD, OrU	27	0.07
Asteraceae *Achillea millefolium* L. [MS - 32]	Ekhelia	Leaves / Roots	Raw / Cataplasm	Direct Application / Mastication	DP	24	0.06
Anacyclus pyrethrum (L.) Link. [MS - 108]	Aoud El Athas	Roots	Decoction	Mouthwash	DP	22	0.06
Matricaria chamomilla L. [MS - 109]	Baboundj	Flower	Decoction / Infusion	Mouthwash	GD, DP, OrU	87	0.24
Artemisia absinthium L. [MS - 33]	Chadjret Meriem	Leaves	Decoction/ Infusion	Mouthwash	GD, DP	49	0.13
Artemisia campestris L. [MS - 35]	Tgouft	Leaves	Decoction	Mouthwash	TD	74	0.20
Artemisia herba alba Asso. [MS - 28]	Chih	Leaves	Decoction	Mouthwash	GD	52	0.14
Carlina gummifera (L.) Less. [MS - 29]	Chouk el alk	Roots	Raw	Direct Application	DP, OrU	68	0.18
Calendula officinalis L. [MS - 34]	El jamra	Flower	Infusion	Mouthwash	OrU, BG	48	0.13
Dittrichia viscosa (L.) Greuter [MS - 110]	Magraman	Leaves	Infusion	Mouthwash	OrU, OI	36	0.10
Echinops bovei Boiss. [MS - 111]	Chouk lhamir	Flower	Raw/ Cataplasm	Direct Application/ Mastication	DP	54	0.14
Helianthus annuus L. [MS - 112]	Abad El Chams	Fruits	Essential Oils	Mouthwash	GD, TD, H	32	0.08
Phagnalon rupestre L. [MS - 113]	Eashbat El Arnab	Flower	Essential Oils /Infusion	Mouthwash	GD, DP	81	0.22
Silybum marianum L. [MS - 114]	Chouk El Jamal	Seeds	Decoction	Mouthwash	DP	41	0.11
Solidago virgaurea L. [MS - 115]	Easa el Dahab	Leaves / Flowering tops	Decoction	Mouthwash	OI, OrU, GD	33	0.09
Globularia alypium L. [MS - 116]	T'asselage	Flower/ Leaves	Infusion	Mouthwash	GD, OI	45	0.12
Betulaceae *Alnus glutinosa* (L.) Gaertn. [MS - 117]	Oud el ahmeur	Leaves / Bark	Decoction	Mouthwash	OI, GD, OrU	30	0.08
Boraginaceae *Anchusa officinalis* L. [MS - 131]	Chaykh el boquol	Leaves /Flower	Powder	Direct Application	OrU, GD	29	0.08

Borago officinalis L. [MS - 132]	Lisan el thour	Whole	Powder / Decoction	Direct Application / Mouthwash	OrU, OI	19	0.05
Brassicaceae *Alliaria petiolata* (M.Bieb.) Cavara & Grande. [MS - 133]	Kerkas	Whole	Cataplasm / Infusion	Mastication / Mouthwash	TD, OI	52	0.14
Brassica nigra (L.) W.D.J. Koch. [MS - 134]	l'khardel	Seeds	Essential Oils / Powder	Mouthwash / Direct Application	DP	22	0.06
Eruca vesicaria (L.) Cav. [MS - 14]	Jarjir Mountafikh	Leaves	Essential Oils / Cataplasm	Mastication / Mouthwash	GD, H	57	0.15
Lepidium sativum L. [MS - 36]	Hab Rashed	Seeds	Powder / Maceration	Mouthwash / Direct Application	TD	48	0.13
Nasturtium officinale R. Br. [MS - 15]	Guernouniche	Leaves	Cataplasm / Maceration	Mastication / Mouthwash	DP, H	41	0.11
Burseraceae *Boswellia carterii* Birdwood. [MS - 16]	Oliban	Gum	Powder / Maceration	Mastication / Mouthwash	DP, OrU, H	24	0.06
Capparaceae *Capparis spinosa* L. [MS - 17]	Kebbar	Root bark/ Fruits	Decoction	Mouthwash	DP	55	0.14
Chenopodiaceae *Chenopodium ambrosioides* L. [MS - 135]	M'khinza	Leaves / Seeds	Cataplasm/ Maceration	Mouthwash / Direct Application	TD, OI	31	0.08
Cucurbitaceae *Citrullus colocynthis* (L.) Schrad. [MS - 37]	Handal	Fruits / Seeds	Cataplasm / Decoction	Direct Application / Inhalation	DP, GD	37	0.10
Cucumis sativus L. [MS - 136]	El Khyar	Fruits	Raw	Mastication	H	26	0.07
Cupressaceae *Juniperus oxycedrus* L. [MS - 38]	Taga	Fruits	Essential Oils / Raw	Mouthwash / Mastication	DP	53	0.14
Juniperus phoenicea L. [MS - 18]	'ar'ar	Leaves	Decoction	Mouthwash	DP, GD	43	0.12
Thuja occidentalis L. [MS - 19]	El Afse	Leaves	Decoction	Mouthwash	GD	64	0.17
Cupressus sempervirens L. [MS - 20]	Sarw	Fruits	Decoction	Mouthwash	DP, GD	15	0.04
Cyperaceae *Cyperus rotundus* L. [MS - 118]	Hachichet essaâd	Tuber / Aerial parts	Essential Oils / Cataplasm	Mouthwash / Mastication	H, GD, TD	32	0.09

Equisetaceae *Equisetum arvense* L. [MS - 119]	Danb el khayl	Stems	Decoction	Mouthwash / Direct application	OI, OrU	28	0.07
Ericaceae *Vaccinium myrtillus* L. [MS - 120]	El shalmoun	Fruits	Fresh juice	Mouthwash	GD, OI	23	0.06
Fabaceae *Acacia nilotica* (L.) Delile [MS - 121]	kharoub klab	Fruits	Decoction / Raw	Mouthwash / Direct application	GD, H, DS	37	0.10
Anthyllis vulneraria L. [MS - 122]	Hchichet ed dab	Whole	Decoction	Mouthwash	OI, GD, OrU	61	0.16
Ceratonia siliqua L. [MS - 123]	El Kharoub	Fruits	Decoction	Mouthwash	DP	52	0.14
Glycyrrhiza glabra L. [MS - 39]	Ark sous	Rhizome	Raw / Decoction	Mouthwash	GD, TD	74	0.20
Cassia angustifolia [MS - 42]	Senna maki	Leaves	Decoction / Raw	Mastication / Mouthwash	GD, OI	143	0.39
Trigonella foenum-graecum L. [MS - 124]	El Hileba	Seeds	Decoction / Maceration	Mouthwash	GD, OI	56	0.15
Fagaceae *Quercus ilex* subsp. *ballota* (Desf.) Samp.. [MS - 40]	Ballout	Roots	Decoction	Mouthwash	GD, OrU, TD	48	0.13
Hypericaceae *Hypericum perforatum* L. [MS - 41]	Bersemoun	Flower	Decoction	Mouthwash	OrU, OI	83	0.22
Gentianaceae *Erythraea centaurium* (L.) Pers. [MS - 125]	kantarioune	Flowering shoots	Decoction	Mouthwash	H, DP	32	0.08
Geraniaceae *Geranium robertianum* L. [MS - 126]	Ibrat alraei	Leaves	Decoction / Cataplasm	Mouthwash / Mastication	OI, OrU, GD	35	0.09
Iridaceae *Crocus sativus* L. [MS - 127]	Alzaefaran	Stigma	Decoction	Mouthwash	GD, OrU	62	0.17
Iris pseudacorus L. [MS - 128]	Souçane el asfeur	Rhizome	Fresh juice	Mouthwash	DP	106	0.29
Juglandaceae *Juglans regia* L. [MS - 129]	El Djouze	Leaves / Roots	Brut / Decoction	Mouthwash /	DP, OrU, BG, H	37	0.10

Lamiaceae *Ajuga iva* L. [MS - 130]	Chendgoura	Aerial parts	Decoction / Maceration	Mouthwash	DP, OrU	335	0.91
Betonica officinalis L. [MS - 137]	Achebet netegerla	Whole	Decoction	Mouthwash	DP	57	0.15
Calamintha officinalis Moench [MS - 138]	Nabta / Menta	Whole	Infusion	Mouthwash	GD, OI, H	19	0.05
Hyssopus officinalis L. [MS - 139]	Zoufa	Aerial parts	Decoction / Infusion	Mouthwash	DP	33	0.09
Lavandula angustifolia Mill. [MS - 140]	El khouzama	Leaves /Flower	Decoction	Mouthwash	GD, H	21	0.05
Marrubium vulgare L. [MS - 27]	Meriouet	Whole	Decoction / Maceration	Mouthwash	GD, DP	114	0.31
Melissa officinalis L. [MS - 13]	Troundjan	Leaves	Infusion	Mouthwash	GD, OrU	83	0.22
Mentha pulegium L. [MS - 12]	Feliou	Aerial parts	Infusion / Essential Oils	Mouthwash / Direct Application	GD, TD, H, DP	79	0.21
Mentha rotundifolia (L.) Huds. [MS - 70]	Timarssat	Aerial parts	Brut / Decoction	Mastication / Mouthwash	OI	217	0.59
Mentha piperita L. [MS - 69]	Nânâ Har	Leaves	Brut / Fresh juice	Mastication / Mouthwash	DP, OI	132	0.36
Mentha spicata L. [MS - 71]	Naânaâ Akhdhar	Aerial parts	Decoction / Infusion	Mouthwash	GD, H	189	0.51
Ocimum basilicum L. [MS - 67]	Hbak	Aerial parts	Decoction	Mouthwash	OrU	276	0.75
Origanum majorana L. [MS - 68]	Merdgouch	Whole	Decoction	Mouthwash	GD, DP	64	0.17
Origanum vulgare L. [MS - 72]	Zaâtar	Leaves	Decoction	Mouthwash	GD, OrU, H	56	0.15
Rosmarinus officinalis L [MS - 11]	Klil el jabal	Aerial parts	Decoction / Infusion	Mouthwash	GD, DP, OrU	105	0.28
Salvia officinalis L. [MS - 10]	Marimya	Leaves	Raw / Decoction	Direct Application / Mouthwash	TD, DP, OrU, OI, GD	157	0.43
Salvia verbenaca ssp. clandestena [MS - 9]	Oum Lemdhamed	Leaves	Infusion	Mouthwash	DP, GD	124	0.33
Satureja montana L. [MS - 77]	zâaetra	Whole	Decoction	Mouthwash	DP, GD, OrU	54	0.15
Teucrium polium L. [MS - 76]	Khayata	Leaves	Decoction	Mouthwash	GD	62	0.17

Thymus algeriensis Boiss. et Reut. [MS - 75]	Djertil	Aerial parts	Powder/ Infusion	Direct Application / Mouthwash	OrU, DP	51	0.13
Thymus munbyanus Boiss. & Reut. [MS - 73]	Ziitra et Jertil	Whole	Decoction	Bain de bouche	OrU, OI	71	0.19
Thymus vulgaris L. [MS - 74]	Zaatar	Flowering tops	Decoction / Essential Oils	Direct Application / Mouthwash	GD, DP, H	87	0.23
Lauraceae *Cinnamomum verum* J. Presl [MS - 43]	Karfa	Bark	Decoction / Essential Oils	Direct Application / Mouthwash	GD, OI, DP, TD	269	0.73
Laurus nobilis L. [MS - 8]	El Rand	Leaves	Decoction / Infusion	Mouthwash	GD, H	110	0.30
Liliaceae *Allium cepa* L. [MS - 7]	Bassel	Bulb	Cataplasm / Fresh juice	Direct Application / Mouthwash	GD, OrU, DP	73	0.20
Allium sativum L. [MS - 6]	Thoum	Bulb	Cataplasm	Direct Application	GD, DP	137	0.37
*Drimia maritima (*L.) Stearn [MS - 44]	Busayla	Bulb	Maceration	Mouthwash	DP, H	159	0.43
Lythraceae *Lawsonia inermis* L. [MS - 78]	Hana'	Leaves	Raw	Direct Application / Mouthwash	OrU	64	0.17
Punica granatum L. [MS - 79]	Romane	Flower/ Fruits	Decoction	Mouthwash	GD, OrU	50	0.13
Malvaceae *Althaea officinalis* L. [MS - 80]	Moudjir	Root	Decoction	Mouthwash	OI	178	0.48
Malva sylvestris L. [MS - 141]	Khobbiza	Whole	Decoction	Mouthwash	DP, OrU, OI, GD	49	0.13
Moraceae *Ficus carica* L. [MS - 45]	Kartous	Leaves / Flower	Decoction / Infusion	Mouthwash	OrU, OI	97	0.26
Myrtaceae *Eucalyptus globulus* Labill. [MS - 81]	Calitous	Leaves	Decoction / Raw Essential Oils	Mouthwash / Mastication	OrU, DP, GD	103	0.28
Myrtus communis L. [MS - 82]	Rihane	Leaves	Decoction	Mouthwash	GD, DP, H	124	0.33
Syzygium aromaticum (L.) Merr. & L. M. Perry [MS - 83]	Quronefal	Flower bud	Raw/ Infusion / Essential Oils	Mastication / Mouthwash /Direct Application	GD, TD, DP, H, OrU	94	0.25

Oleaceae *Olea europaea* L. [MS - 46]	Zaytoun	Leaves / Fruits	Raw / Decoction / Essential Oils	Mastication / Mouthwash	GD, DP, OrU	353	0.96
Phillyrea angustifolia L. [MS - 84]	El ketam	Leaves	Raw	Mastication	OI, OrU	209	0.57
Papavéraceae *Papaver rhoeas* L. [MS - 85]	Khachkhach	Leaves	Decoction	Mouthwash	DP	101	0.27
Pédaliaceae *Sesamum indicum* L. [MS - 86]	Djanjelan	Seeds	Essential Oils	Mouthwash	GD, TD	97	0.26
Piperaceae *Piper nigrum* L. [MS - 87]	FalfulAkehal	Seeds	Decoction / Powder	Mouthwash / Direct Application	TD, DP, OI	84	0.23
Plantaginaceae *Plantago major* L. [MS - 88]	Ouden egdi	Whole	Fresh juice / Decoction	Mouthwash	DP, H, OI	287	0.78
Poaceae *Hordeum vulgare* L. [MS - 48]	Chaire	Young shoot	Fresh juice / Raw	Mouthwash / Mastication	GD, DP, H, OrU	83	0.22
Triticum aestivum L. [MS - 5]	Qameh	Young shoot	Fresh juice / Raw	Mouthwash / Mastication	GD, DP, H OrU	87	0.23
Polygonaceae *Polygonum hydropiper* L. [MS - 4]	Nar el berd	Aerial parts	Decoction	Mouthwash	DP, OrU	87	0.23
Rumex vesicarius L. – GBIF. [MS - 47]	hummayd	Root	Decoction	Mouthwash	DP	43	0.11
Portulacaceae *Portulaca oleracea* L. [MS - 3]	Berzeqala	Leaves	Fresh juice	Mouthwash	DP	37	0.10
Primulaceae *Anagallis arvensis* L. [MS - 49]	Bou zeroubat	Whole	Maceration	Mouthwash / Direct Application	DP	61	0.16
Pteridaceae *Adiantum capillus-veneris* L. [MS - 61]	Achbet el ma	Leaves	Decoction	Mouthwash	GD	49	0.13
Ranunculaceae *Nigella sativa* L. [MS - 60]	Sanoudj	Seeds	Decoction	Mouthwash	GD, DP	39	0.10

Rhamnaceae *Ziziphus lotus* (L.) Lam [MS - 62]	El Sedra	Leaves	Maceration / Infusion	Mouthwash	GD, OI, DP, H	08	0.29
Rosaceae *Agrimonia eupatoria* L. [MS - 57]	Terfag	Leaves	Decoction	Mouthwash	OrU, OI	121	0.33
Crataegus monogyna Jacq. [MS - 58]	Bou Mekherri	Flower / Fruits	Infusion	Mouthwash	GD, OI, OrU	64	0.17
Eriobotrya japonica (Thunb.) Lindl. [MS - 63]	Zaarura	Leaves /stem	Decoction	Direct Application	OrU	87	0.23
Geum urbanum L. [MS - 64]	Hachichet el mebrouka	Rhizome	Decoction	Mouthwash	OI, BG	97	0.26
Malus pumila Mill. [MS - 59]	Tofah	Fruits	Apple cider vinegar	Mouthwash	H, GD, BG	58	0.15
Potentilla reptans L. [MS - 65]	Bentalis	Root	Decoction	Mouthwash	OrU, OI	189	0.51
Prunus spinosa L. [MS - 66]	Berqouq el maïz	Fruits	Decoction	Mouthwash	GD	31	0.08
Rosa canina L. [MS - 1]	Ouard zeroub	Fruits	Decoction	Mouthwash	BG	43	0.12
Rubus ulmifolius Schott [MS - 2]	Toutte El Ealiqe	Leaves / Fruits	Decoction	Mouthwash	OrU, OI, GD, DP	39	0.10
Rutaceae *Citrus limon* (L.) Burm. f. [MS - 89]	Limon	Fruits	Fresh juice	Mouthwash	H, GD, DP	129	0.35
Ruta montana L. [MS - 90]	Fidjela / Fidjle	Leaves	Infusion	Mouthwash	GD	197	0.53
Salicaceae *Populus nigra* L. [MS - 93]	El Safesaf	Leaves	Infusion	Mouthwash	GD, OI	184	0.50
Salvadoraceae *Salvadora persica* L. [MS - 91]	El Erak / Miswak	Root	Raw	Brushing	GD, TD, H	71	0.19
Scrophulariaceae *Verbascum thapsus* L. [MS - 92]	Abwsira / Udin el himar	Root	Decoction	Mouthwash	DP	309	0.84
Solanaceae *Solanum lycopersicum* L. [MS - 55]	Tamatim	Fruits	Fresh juice	Mouthwash	DP	31	0.08

Solanum tuberosum L. [MS - 56]	Batata	Fruits	Raw	Direct Application	DP	76	0.20
Théaceae *Camellia sinensis* (L.) Kuntze. [MS - 54]	Al shshay alakhdar	Leaves	Maceration / Infusion	Mouthwash	TD, GD, H	69	0.18
Thymelaeaceae *Daphne gnidium* L. [MS - 94]	Lazzaz	Root	Decoction	Mouthwash	DP	63	0.17
Urticaceae *Parietaria officinalis* L. [MS - 95]	Chih el djenan	Leaves	Raw	Mouthwash	DP	42	0.11
Urtica dioica L. [MS - 52]	Horrīg	Leaves	Decoction	Mouthwash	OrU, GD, BG	57	0.15
Verbénaceae *Verbena officinalis* L. [MS - 53]	Louiza	Leaves	Decoction / Raw	Mouthwash / Mastication	GD, OI	92	0.25
Violaceae *Viola odorata* L. [MS - 96]	Benafsedj	Flower	Infusion	Mouthwash	OrU	156	0.42
Vitaceae *Vitis vinifera* L. [MS - 50]	Zabib	Fruits	Cataplasm	Mastication / Direct Application	GD, TD	32	0.08
Xanthorrhoeaceae *Asphodelus microcarpus* L. [MS - 97]	Berwag	Leaves /Root	Decoction / Maceration	Mouthwash	DP, OI	78	0.21
Zingiberaceae *Alpinia officinarum* Hance. [MS - 98]	Khanjelan	Rhizomes	Decoction / Maceration	Mouthwash	GD, OI	54	0.14
Curcuma longa L. [MS - 99]	El Kurkoum	Rhizomes	Powder / Cataplasm	Brushing / Direct Application	DP, GD	142	0.38
Zingiber officinale Roscoe. [MS - 100]	Zanjabayl	Rhizomes	Decoction/ Raw / Cataplasm	Mouthwash / Direct Application	DP, TD, H	115	0.31
Zygophyllaceae *Peganum harmala* L. [MS - 51]	Harmel	Seeds/ Leaves	Decoction	Mouthwash	DP, GD, H	178	0.48

BG: Bleeding gums; *DP:* dental pain; *DS:* dental stain; *GD:* gum disease; *H:* Halitosis; OI: *Oral infections;* OrU: oral ulcers; *TD:* tooth decay

Mode of Preparation

Herbs are widely recognized as a plentiful source of remedies for numerous health issues. Nonetheless, the ethnopharmacological applications of this medicinal flora may differ owing to the tenets of distinct traditional medical systems and the concoctions created by indigenous communities (Path *et al.* 2016). Plants have been utilized either singularly or in conjunction with multiple types within the same formulation to address certain oral pathologies. However, treatments derived from an individual plant are favored due to their ease of production and to mitigate toxicity (Zougagh *et al.* 2019). As shown in table 1 the most applied mode of preparing medicinal plants is decoction (86 species) followed by the crude form (29 species), infusion (26 species) and cataplasm for 16 species. Then, the essential oil (13 species) and the fresh juice (12 species). The decoction method is the most efficient way to extract and absorb beneficial compounds while sanitizing the plant; yet, it may also degrade certain active constituents (Benlamdini et al., 2014). In this procedure, the raw substance is subjected to boiling in a predetermined quantity of water for a specific duration; thereafter, it is cooled and either strained or filtered. This method is appropriate for isolating water-soluble, thermally stable components (Handa *et al.* 2008). In addition, there are plants that can have two modes of preparation, which differ depending on the disease being treated. The botanical formulations employed for the remedy of oral ailments in a conventional manner are frequently utilized as mouth rinses (122 species), applied directly (28 species), and consumed through chewing (26 species). They are additionally utilized through brushing (6 species) (Table 1). Mouthwash revitalizes unpleasant breath, aids in diminishing plaque and gingivitis, combats tooth decay, and averts cavities. Mouthwash can significantly enhance dental hygiene. Nevertheless, mouthwashes possess minimal efficacy in infiltrating the subgingival area. (Eley 1999; Moran 2000). They ought to be considered supplementary to the main mechanical cleaning techniques, rather than being viewed as replacements (Eley 1999). The efficacy of mouthwash is contingent upon the patient's proficiency in rinsing adequately (Macfarlane *et al.* 2011). Particularly, the roots of certain plants, such as Salvadora persica, are utilized as toothbrush sticks. It is referred to as Miswak, a widely utilized natural toothbrush that has been employed for oral hygiene by Muslims throughout for centuries, particularly in the Middle East (Aljarbou *et al.* 2022). Numerous in vitro investigations have documented the antibacterial properties of Miswak against periodontal pathogens and cariogenic bacteria such as *Streptococcus faecalis, Staphylococcus aureus, Streptococcus pyogenes, Streptococcus mutans, Lactobacillus acidophilus, Pseudomonas aeruginosa, Aggregatibacter actinomycetemcomitans,* and *Porphyromonas gingi*valis (Sher *et al.* 2011; Amir Alireza *et al.* 2014; Salem *et al.* 2018). *Salvadora persica* exhibits several functions including antibiofilm, antifungal, antioxidant, cytotoxic, anti-inflammatory, and antiulcer actions (Aljarbou *et al.* 2022).

Parts used

All parts of plants, including leaves, fruits, flowers, roots, seeds, bark, bulb, rhizome, buds, aerial part and the whole plant (Table 2). The results obtained show that the leaf is the most used organ (60 species), followed by the fruit in second place by 20 species and the flowers in third place by 16 species. Roots (14 species) and seeds (12 species). The utilization of leaves and aerial components is considered predominantly safe and sustainable (Mahmood *et al.* 2012). The majority of traditional remedies consisted of uncomplicated formulations derived from plant components, while some included combinations of many plants and various sections (Hosseini *et al.* 2022). In addition, the use of the whole plant and the aerial part of the plant was relatively similar (11 species and 10 species respectively). Consequently, the bark of different part (trunk, root, fruit and stem) was used for 7 species. The rhizomes used for 4 species and the stems, bulbs and other parts used only for 3 species. The results thus obtained are compatible with those of Zougagh *et al.* (2018). It has been found that leaves were by far the most exploited organs by herbalists and the most likely explanation of this fact is that leaves are reservoirs and centers of biomolecules synthesis and derived organic matter; they supply the larger part of essential oils, alkaloids and glycosides (Ould el hadj *et al.* 2003; Benlamdini *et al.* 2014). Furthermore, according to Salhi *et al.* (2011) the ease of use, better accessibility for field collection and the speed of harvest may also explain the superiority of leaves exploitation. Several studies have reported that, Foliage was the predominant botanical component included in herbal formulations for addressing oral ailments. The simplicity of extraction, preparation, and application of remedies may account for the prevalent utilization of leaves in herbal formulations (Bhattarai *et al.* 2009; Verpoorte & Memelink 2002). Roots were frequently utilized as toothpicks for the maintenance of dental hygiene, and in certain instances, powdered root bark and juice were allegedly employed for the treatment of oral ailments. An examination of the preparation methods indicated that numerous individuals from the rural demographic utilized decoctions as gargles for oral ulcers, inflammation, gum ailments, and halitosis, whereas traditional healers often dispensed herbal mixtures in powdered form, likely owing to their convenience in storage and versatility in application. In numerous instances, traditional recipes are crafted using combinations of multiple plant species, utilizing various portions of these plants, and this amalgamation may enhance synergistic effects in herbal concoctions (Eddouks *et al.* 2014; Juárez-Reyes *et al.* 2015).

Use value and fidelity level of plant species

The Use Value of the cited plant ranged from 0.04 to 0.94. The highest UVs were recorded for *Syzygium aromaticum* (0.94), *Juglans regia* (0.91), *Piper nigrum* (0.78), *Mentha spicata* (0.75) and *Thymus vulgaris* (0.73). Then, *Mentha pulegium* (0.59) and *Olea europaea* (0.57). The most likely explanation of these high values is the fact that these plants are the most familiar and have for a long time been employed by a large number of informants, having some origin of safety and reliability. The fidelity level (FL) of the species in the study area was between 30.76 and 100 %. The highest FL value of 100% was reported for 38 species-category combinations including the following 20 namely: *Capparis spinosa* L.; *Juniperus oxycedrus* L.; *Ceratonia siliqua* L. ; *Iris pseudacorus* L. ; *Betonica officinalis* L. ; *Hyssopus officinalis* L. ; *Thymus vulgaris* L. ; *Cinnamomum verum* J. Presl; *Allium sativum* L. ; *Syzygium aromaticum* L. ; *Rumex vesicarius* L. ; *Portulaca oleracea* L. ; *Verbascum thapsus* L. ; *Solanum lycopersicum* L. ; *Solanum tuberosum* L. ; *Daphne gnidium* L. ; *Parietaria officinalis* L. ; *Zingiber officinale* were used to treat dental pain (Table 2). Our study revealed also nine species against gum diseases with high 100 % FL: *Sambucus ebulus* L.; *Phoenix dactylifera* L.; *Artemisia herba alba; Thuja occidentalis* L.; *Teucrium polium* L.; *Adiantum capillus-veneris* L.; *Prunus spinosa* L.; *Ruta montana* L.; *Punica granatum* L. Flora serves as a crucial reservoir of bioactive compounds such as phenolics, aromatic substances, terpenoids, sterols, essential oils, alkaloids, tannins, and anthocyanins, which are vital in the management of various ailments (Sharifi-Rad et al., 2020). Clove, the desiccated flower bud of Syzygium aromaticum (L.), is extensively utilized globally as a spice for its potent fragrance and as a raw ingredient in numerous traditional medicinal preparations (Adegbola *et al.* 2022). The particular biological functions that promote human well-being in spices are ascribed to the existence of phytonutrients/phytochemicals or bioactive substances that exhibit significant antioxidant properties. Clove oil, abundant in eugenol and β-caryophyllene, is widely utilized as a cure for dental pain due to its powerful antibacterial and analgesic properties. The extracts from clove and oil have potent antioxidant and antibacterial properties. Numerous health-enhancing and pharmacological effects have been documented for the extracts, oils, and constituents derived from cloves (Devkota et al., 2022). Certain applications encompass the utilization of clove oil for alleviating toothache, dental decay, and pyorrhea; as well as for treating headaches, sore throats, respiratory conditions (such as coughs, colds, bronchitis, asthma, sinusitis, and TB) and gastrointestinal disorders (Otunola 2021). *Juglans regia L.,* commonly known as walnut, is a sizable, perennial tree that thrives in temperate regions globally. It is well valued for its nutritious seeds and superior wood. Its bark, foliage, and husk serve as colorants and are utilized in traditional medicine as herbal treatments for many ailments. *Juglans regia L*. is mostly recognized for its active compound, Juglone, which provides numerous medicinal advantages to the plant (Liu 2008; Bennacer *et al.* 2022). The fruits of the date palm (*Phoenix dactylifera L.)* are an essential element of the diet and a primary food source in Arabian nations. Date fruit is documented in traditional medicine for addressing numerous ailments (Zia *et al.* 2022). Moreover, date palm fruits have exhibited immunomodulatory (Puri *et al.* 2000), antibacterial, antifungal, and antioxidant properties (Shraideh *et al.*1998; Halabi *et al.* 2022), antihyperlipidemic effects (Naseer *et al.* 2022), hepatoprotective capabilities (Saafi *et al.* 2011), anticancer properties (Ishurda and John 2005), renal protective functions (Abdelhafez et al., 2022), and antimutagenic effects (Verma *et al.* 2016). *Artemisia herba-alba* is a greenish-silver, called "Shih" in the Algerian vernacular, a perennial herb growing in semiarid and arid climates (Ayad *et al.* 2022). In traditional medicine, it was recognized for its healing and medicinal attributes, utilized for alleviating colds, coughs, and gastrointestinal issues (Ait-Kaki *et al.* 2018), as well as for ethnic applications against diabetes and hypertension (Mahomoodally *et al.* 2013), and for conditions such as bronchitis, diarrhea, neuralgias, and hypertension (Ziyyat *et al.* 1997). *Thuja occidentalis L.* originates from Eastern North America and is grown in Europe and Brazil as an ornamental species, commonly referred to as the "tree of life" or "white cedar. In conventional medicine, it is frequently employed to address hepatic disorders, bullous bronchitis, psoriasis, nocturnal enuresis, amenorrhea, cystitis, uterine cancers, diarrhea, and rheumatism (Caruntu *et al.* 2022). *Thuja occidentalis* L. presents a varied range of pharmacological activities, such as antibacterial, antifungal (Jahan *et al.* 2010; Bellili *et al.* 2018), anti-inflammatory (Silva *et al.* 2017), antioxidant activity (Nazir et al., 2016), antitumoral (Saha *et al.* 2014;Torres *et al.* 2016), hypolipidemic, antiatherosclerotic (Dubey & Batra 2009), antidiabetic (Dubey & Batra 2008), antiviral, immunostimulent (Tegtmeier *et al.* 1994), gastroprotective (Das &Rani, 2013, radioprotector (Sunila & Kuttan 2005) and sedative (Aziz *et al.* 2014). In Algeria, it is traditionally used for its hypolipidemic, antioxidant, antibacterial, hypoglycemic and anti-inflammatory properties (Ait Chaouche *et al.* 2018). *Adiantum capillus-veneris L*. (Family: Pteridaceae) is a well-known and safe medicinal plant used in traditional and modern medicine due to its useful pharmacological properties (Kashkooe *et al.* 2021). *Prunus spinosa L*. is a wild plum tree native to Europe, western Asia and north-west Africa, and has been naturalised in New Zealand and North America (Tutin *et al.* 1968). The ethnopharmacological literature indicates that the flowers have anti-inflammatory, vasoprotective, detoxifying, diuretic and spasmolytic effects, and are reported as components of traditional compound herbal remedies for intestinal and respiratory disorders and various cardiac problems such as myocarditis, cardiac neurosis and atherosclerosis (Blumenthal and Busse 1998; Marchelak *et al.* 2017; Magiera *et al.* 2022). *Ruta montan*a (*R. montana*) also belongs to the Rutaceae family and is called Fijel in Algeria. *R. mo*ntana contains alkaloids, sterols, triterpenes, complex anthracenes, and reductive substances (Daoudi *et al.* 2016) along with flavonoids (Benali *et al.* 2020). In folk medicine, *R.mon*tana is used in the treatment of

abscesses, as an emetic in children (Khabbach *et al.* 2012), in the treatment of menstrual problems, sore eyes, as an antispasmodic, a sedative and an abortifacient (El-Ghazouani *et al.* 2021; Hammami *et al.* 2015). There has been increasing research that shows pomegranate has various pharmacological properties like anti-diabetic, anti-tumor, anti-inflammatory, anti-malaria, antifibrotic, anti-fungal and anti-bacterial activities. Pomegranate intake improves gut flora, thus helps in the prevention of obesity and diabetes (Maphetu *et al.* 2022). The fruits, peels, leaves, roots, flowers, and barks used in traditional medicine are rich in phytochemical constituents, especially phenolic compounds, which show diverse biological properties including antiproliferative, anti-invasive, antimetastatic, and apoptotic effects against cancer (Peršuric *et al.* 2020).

Reported indication

Three species against halitosis and oral ulcer with highest FL (100%) were Cucumis sativus L.; Mentha pulegium L.; Mentha spicata L. and Olea europaea L.; Eriobotrya japonica; Viola odorata L. respectively. Cucumis sativus L. is used as therapeutic agent for treatment of anaemia and hypertension and for oral health in medicinal preparations (Mujoriya & Bodla 2012) indicating that C. sativus may serve as a remedy for halitosis and therapeutic agent. Alkaloids were also detected in the homogenate of C. sativus fruit. Pharmaceuticals use botanical species containing alkaloids to relieve headaches and fever. Mentha species (Lamiaceae) are aromatic, medicinal and ornamental herbaceous plants widely distributed in the world and growing in various environments (El-Gazar *et al.* 2022). *Mentha pulegium* L. (Pennyroyal) is a fragrant perennial herb of the mint family, with a strong minty smell. It was grown and utilised in the traditional manner as an insect deterrent, food preservative, emmenagogue and to treat menstrual discomforts (Teixeira *et al.* 2012). Spearmint (*Mentha spicata L.*) is a cultivated perennial, rhizomatous and hairless plant. Spearmint leaves – fresh and dried – are used in teas, as a spice and to improve the flavour of foods, dishes and drinks. Its leaves, extracts and essential oil (EO) have been used traditionally to treat a wide range of human ailments or to relieve discomfort (Topalov 1989). Oleanolic acid is extracted from the roots and leaves of the olive (*Olea europaea*). Oleanolic acid has a wide range of biological functions such as immunomodulatory, antioxidant, anti-inflammatory, and cardioprotective effects (Alesci *et al.* 2022). Loquat (*Eriobotrya japonica* (Thunb.) Lindl.) is a subtropical fruit. Loquat is grown under different climatic conditions from tropical to temperate and is consumed as whole fruit and in various processed forms. It is rich in carbohydrates, vitamins, organic acids and minerals. Loquat is a rich source of many bioactive compounds such as phenolics, flavonoids, carotenoids, and triterpenoids, which possess diverse biological activities, including antioxidant, antiviral, anti-tumour, hypoglycaemic, anti-inflammatory, cytotoxic, antimutagenic, and hypolipidemic activities (Sagar *et al.* 2020). *Viola odorata Linn*. (Sweet violet) is a small perennial plant of the family Violaceae and is commonly found in open places and along roadsides. *V. odorata* has been reported to have various biological activities including anti-inflammatory, antibacterial, analgesic, anticancer, diuretic, laxative and antioxidant activities. Phytochemical studies on the aerial parts of the plant have shown the presence of various constituents including cyclotides, steroids, flavonoids, alkaloids, vitamins A and C, saponins and tannins in the alcoholic and aqueous extracts (Colgrave *et al.* 2008; Akhbari *et al.* 2012).

Two species against tooth decay with highest FL 100% were Salvadora persica L.and Syzygium aromaticum. For bleeding gums three species *Rosa can*ina L.; *Juglans regia* L. and *Malus pumila* with FL of 100%, 95.82% and 52.91 % respectively. Finally, ttwo species against oral infections: *Piper nigrum* L.and *Borago officinalis* L. with FL of 56.44% and 30.76 % respectively (Table 02). This may be due to the fact that these species are specifically used for the treatment of this category of diseases. Generally, the highest FL is obtained from species for which almost all the local population uses it to treat the same diseases (Heinrich et al., 1998). Haemorrhaging gums indicate gingivitis, which is the inflammation of the gums. It is a prevalent and benign kind of periodontal disease, resulting from the accumulation of plaque along the gumline. The treatment of gingivitis and periodontitis takes a comprehensive strategy and the guidance of a dental professional. Some medical plants and herbs may also help due to their anti-inflammatory, antibacterial and antioxidant properties. A dental discomfort or toothache refers to pain localised in and around the teeth and jaws. Tooth decay, an infection, compromised or fractured fillings, or gum recession may lead to it. An often utilised herb for alleviating dental discomfort is Jatropha gum. Jatropha gum is still considered to alleviate dental pain (Zahara, 2022). Gum disease is when the gums become inflamed, sore and hemorrhagic. It is quite prevalent; nevertheless, it is crucial to have it examined by a dental professional. Gum disease is usually caused by plaque building up on the teeth and at the gum line. Herbal medicines are effective and comparable to antimicrobial drugs in the management of different periodontal diseases (Lanka & Kumar, 2022). Halitosis, frequently referred to as "bad breath," is a disorder marked by offensive odours that periodically arise from the mouth, impacting around 30% of the general populace (Gokdogan et al., 2015). The origins of halitosis encompass numerous intra-oral and extra-oral elements. Nonetheless, the predominant origin of halitosis is the oral cavity itself (90%) (Tonzetich, 1978). Halitosis is primarily induced by bacterial colonisation in the oral cavity; hence, employing the aforementioned plants as antiseptics in the management of oral ailments may assist in alleviating oral odour. Indeed, most of the plants used in this

study are rich in chemical constituents that can explain their effects (Akkaoui and Ennibi, 2017). Recurrent aphthous stomatitis is the most common oral ulcerative condition, characterised by round ulcerations with a red halo and a white-yellowish pseudomembrane at the center (Akintoye and Greenberg, 2014). There is a lot of evidence that medicinal herbs with anti-inflammatory, antibacterial and antioxidant properties can help to reduce pain and speed up the healing process of RAS (Li et al., 2016). Gallium verum L. (G. verum, lady's bedstraw) is a member of the Rubiaceae family and has historically been recognised as a potent herbaceous plant with several medicinal attributes (Vuletic et al., 2022). Dental caries or tooth decay is little holes that appear in the enamel of our teeth. They arise due to the production of acid by bacteria from sugar present on our dental surfaces. The predominant bacterium responsible for dental caries is Streptococcus mutans. These pathogenic indicators can be controlled to prevent dental caries. *Uvaria chamae* P. Beauv. This botanical remedy has a historical use for several maladies including oral infections. Plant extracts from roots, leaves and bark have been shown to have antibacterial properties including activity against caries-inducing *S. mutans* (Madiba et al., 2023). Centuries ago, oral infections were rife and one of the main killers. Dental infections are common when bacteria invade the pulp and extend to surrounding tissues, which may be caused by dental caries, trauma, or dental procedures (Erazo and Whetstone, 2022). Currently, there is increasing interest in substances obtained from natural herbs as potential adjuncts in the management of oral conditions. The use of natural substances with antibacterial and anti-inflammatory properties has been widely used for treatment of oral infections and improvement of oral health (Chinsembu, 2016).

Informant consensus factor values of categories of diseases

The ICF measurements are summarized in Table 3. Seven categories were reported namely, bleeding gums, dental pain, gum disease, halitosis, oral ulcers, oral infections and tooth decay. The acquired ICF values for each reported categories of diseases designate clearly the level of the collective understanding for medicinal plants applications. The results show that ICF's values ranged from 0.589 to 0.999 per used disease categories. An ICF of 0.979 was recorded for the use of gums disease class with 82 species, The high Informant Consensus Factor (ICF) recorded for gum diseases indicates a high degree of agreement among informants regarding the medicinal plants traditionally used to manage this category of health conditions. This consensus may reflect the shared transmission of traditional knowledge and the importance attributed to these plants within the surveyed communities. However, the ICF value does not provide information about the actual prevalence or frequency of gum diseases in the study area. The higher FL values were recorded for the largely used medicinal herbs compared to those rarely desired by the regional people. Nevertheless, medicinal herbs largely used like treatment of one sole aliment registered 100% FL values in comparison with those used like remedies for further than one category of disease. The results thus obtained were compatible with some previous reported ones (Harouak et al., 2018; Zougagh et al., 2018; Najem et al., 2020).

Table 3. Most frequently used plants for different categories based on highest FL (%) and ICF values of category of disease

Pathology	Plants species	FL (%)	Nt	Nur	ICF
Bleeding gums			06	521	0.990
	Rosa canina L.	100			
	Juglans regia L.	95.82			
	Malus pumila	52.91			
Dental pain			71	4092	0.983
	Achillea millefolium L.	100			
	Echinops bovei Boiss.	100			
	Capparis spinosa L.	100			
	Juniperus oxycedrus L.	100			
	Ceratonia siliqua L.	100			
	Iris pseudacorus L.	100			
	Betonica officinalis L.	100			
	Hyssopus officinalis L.	100			
	Thymus vulgaris L.	100			
	Cinnamomum verum J. Presl	100			
	Allium sativum L.	100			
	Syzygium aromaticum (L.) Merr. & L. M. Perry	100			
	Rumex vesicarius L.	100			
	Portulaca oleracea L.	100			
	Verbascum thapsus L.	100			

	Solanum lycopersicum L.	100			
	Solanum tuberosum L.	100			
	Daphne gnidium L.	100			
	Parietaria officinalis L.	100			
	Zingiber officinale Roscoe	100			
	Mentha pulegium L.	91.24			
	Piper nigrum L.	89.19			
Gum disease			81	3987	0.980
	Sambucus ebulus L.	100			
	Phoenix dactylifera L.	100			
	Artemisia herba alba Asso.	100			
	Thuja occidentalis L.	100			
	Teucrium polium L.	100			
	Adiantum capillus-veneris L.	100			
	Prunus spinosa L.	100			
	Ruta montana L.	100			
	Punica granatum L.	100			
	Rubus ulmifolius Schott	93.79			
	Alpinia officinarum Hance	93.66			
Halitosis			38	2495	0.985
	Cucumis sativus L.	100			
	Mentha pulegium L.	100			
	Mentha spicata L.	100			
	Zingiber officinale Roscoe	92.69			
	Syzygium aromaticum (L.) Merr. & L. M. Perry	86.68			
	Citrus limon (L.) Burm. f.	80.20			
Oral ulcer			50	2558	0.981
	Olea europaea L.	100			
	Eriobotrya japonica (Thunb.) Lindl	100			
	Viola odorata L.	100			
	Quercus ilex subsp. *ballota* (Desf.) Samp	93.97			
	Rubus ulmifolius Schott	88.37			
	Punica granatum L.	87.64			
Oral infections			38	91	0.589
	Piper nigrum L.	56.44			
	Borago officinalis L.	30.76			
Tooth decay			19	1481	0.988
	Salvadora persica L.	100			
	Syzygium aromaticum (L.) Merr. & L. M. Perry	100			
	Camellia sinensis (L.) Kuntze	73.01			

BG Bleeding gums, DP dental pain, DS dental stain, GD gum disease, H Halitosis, OI Oral infections, OrU oral ulcers, TD tooth decay

Conclusion

Results indicated that respondents in the Setif regions utilized medicinal plants. There was arelation between the sociodemographic characteristics of respondents and their use of these plants. Adolescents, in contrast to senior citizens, often lack awareness of the names and uses of most plants. Women demonstrate a greater interest in medicinal plants compared to men, who possess more knowledge about their benefits and therapeutic properties. Moreover, the analysis of the collected data facilitated the transformation of traditional oral knowledge in this region into written form by compiling a list of the most significant medicinal flora and their therapeutic applications. This information can provide a foundation for experimental and clinical research supporting the use of natural substances in the management of oral diseases. Such research not only enhances the understanding of traditional practices but also bridges the gap between ancient wisdom and

modern science. By documenting and validating these medicinal uses, we can promote sustainable practices and encourage the preservation of biodiversity in the region.

Declarations

List of abbreviations:

BG - Bleeding gums; COVID-19 - CoronaVirus Disease 2019; *DP* - dental pain; *DS* - dental stain; EO - essential oil; *GD* - gum disease; *H* - Halitosis; OI - *Oral infections;* OrU - oral ulcers; *TD* - tooth decay; WHO - World Health Organization

Ethics approval and consent to participate: The development of the study followed the ethical and legal guidelines for the development of research on traditional knowledge.

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Literature cited

Abdelhafez HDH, Abdallah, AA, El-Dahshan AA, Abd El-baset YA, Morsy OM, Ahmed MBM. 2022. Ameliorative effects of the phytochemicals in dates (Phoenix dactylifera) against the toxicological changes induced by fipronil in male albino rats. Toxicology (480): 153313. doi: 10.1016/j.tox. 2022.153313.

Adegbola MV, Anyim G, Ntwasa M, Ayeleso AO, Oyedepo TA. 2022. Potential Effect of *Syzygium aromaticum* (Cloves) Extract on Serum Antioxidant Status and Lipid Profiles in Wistar Rats with Artesunate Toxicity. Applied Sciences (12) : 8216. doi: 10.3390/app12168216.

Agarwal K, Varma R. 2012. Some ethnomedicinal plants of Bhopal district used for treating stone diseases. International Journal of Pharmacy and Life Sciences (3) : 1356-1362.

Aissi A, Boudjelal Y. 2014. Screening phytochimique et mise en évidence de l'activité antimicrobienne des feuilles et des écorces de *Juglans regia*. Mémoire de master en biologie : Option Microbiologie Appliquée. Université El-Hadj Lakhdar. Batna, 41p.

Ait Chaouche FS, Mouhouche F, Hazzit M. 2018. Antioxidant capacity and total phenol and flavonoid contents of *Teucrium polium* L. grown in Algeria. Mediterranean. Journal of Nutrition and Metabolisme (11): 135-144.

Ait-Kaki A, Diaw MT, Geda F, Moula N. 2018. Effects of *Artemisia herba-alba* or olive leaf (*Olea europaea*) powder supplementation on growth performance, carcass yield, and blood biochemical parameters in broilers. Veterinary World 11(11): 1624.

Akhbari M, Batooli H, Kashi FJ. 2012. Composition of Essential Oil and Biological Activity of Extracts of *Viola odorata* L. From Central Iran. Natural Product Research 26: 802-809. doi: 10.1080/14786419.2011.558013.

Akintoye SO, Greenberg MS. 2014. Recurrent aphthous stomatitis. Dental Clinics of North America (58): 281-297. doi: 10.1016/j.cden.2013.12.002.

Akkaoui S, Ennibi OK. 2017. Use of traditional plants in management of halitosis in a Moroccan population. Journal of Intercultural Ethnopharmacology 6(3): 267-273. doi: 10.5455/jice.20170522103525.

Alesci A , Miller A , Tardugno R , Pergolizzi S . 2022. Chemical analysis, biological and therapeutic activities of *Olea europaea* L. extracts. Natural Product Research (36) : 11.doi: 10.1080/14786419. 2021.1922404.

Ali-Khodja M. 2015. Schéma directeur d'aménagement touristique de Sétif SDATW 2030. Consulté le 17 juin 2020. https://www.slideshare.net/alikhodjamehdi/sdatw-setiflivre-i

Aljarbou F, Almobarak A, Binrayes A, Alamri HM. 2022. *Salvadora persica's* Biological Properties and Applications in Different Dental Specialties: A Narrative Review. Evidence-Based Complementary and Alternative Medicine. 8667687. doi: 10.1155/2022/8667687.

Al-Quran S. 2009. Ethnopharmacological survey of wild medicinal plants in Showbak, Jordan. Journal of Ethnopharmacology 123: 45-50. doi: 10.1016/j.jep.2009.02.031.

Ameziane R, El Wady W, Chbicheb S, Halabi N, Rhachi S, Lahlaouti R, Lakhal A, El-Amrani H, Fadlallah H. 2014. Guide de promotion de la Santé Bucco-dentaire. Compagne Nationale pour la Santé Bucco-dentaire, Ministère de la Santé, Royaume du Maroc, Edition, 36(4).

Amir Alireza RG, Afsaneh R, Seied Hosein MS, Siamak Y, Afshin K, Zeinab K, Mahvash MJ, Reza RA. 2014. Inhibitory activity of *Salvadora persica* extracts against oral bacterial strains associated with periodontitis: an *in-vitro* study. Journal of Oral Biology and Craniofacial Research. 4(1): 19-23.

ANDI. 2013. Agence Nationale de Développement de l'Investissement, 2013. Invest in Algeria : wilya de Sétif. Consulté le 16 juin 2020. http://www.andi.dz/PDF/monographies/setif.pdf

Anyinam C. 1995. Ecology and ethnomedicine: exploring links between current environmental crisis and indigenous medical practices. Social Science and Medicine. 4 :321-329. doi: 10.1016/0277-9536(94)E0098-D.

Aribi I. 2013. Etude ethnobotanique de plantes médicinales de la région du Jijel : étude anatomique, phytochimique, et recherche d'activités biologiques de deux espèces. Mémoire de magister, Univ. Houari Boumediène (USTHB), Algé, pp. 69-71.

Ayad N, Benaraba R, Hemida H, Abdellah F. 2022. Biological activities of phenolic extracts from *Artemisia herba-alba* Asso grown in western Algeria. European Journal of Biological Research 12(1): 46-61.

Aziz A, Khan IA, Munawar SH, Raza MA. 2014. Pharmacological evaluation of sedative activity of methanolic extract of *Thuja occidentalis* in mice. International Journal of Advanced Biological and Biomedical Research 2: 202-210.

Balde AM, Traore MS, Diallo MST, Balde ES, Huang Y, Liu Z, Oulare K, Barry MS, Balde MA, Camara A, Berghe DV, Vlietinck A, Pieters L. 2015. Ethnobotanical survey, antimicrobial and anticomplementary activities of Guinean medicinal plants traditionally used in the treatment of inflammatory diseases in Conakry and Dubreka. Journal of Plant Science 3: 11-19.

Bellili S, Aouadhi C, Dhifi W, Ghazghazi H, Jlassi C, Sadaka C, El Beyrouthy M, Maaroufi A, Cherif A, Mnif W. 2018. The influence of organs on biochemical properties of tunisian *Thuja occidentalis* essential oils. Symmetry 10: 649.

Benali T, Habbadi K, Khabbach A, Marmouzi I, Zengin G, Bouyahya A, Chamkhi I, Chtibi H, Aanniz T, Achbani EH, Hammani K. 2020. GC-MS analysis, antioxidant and antimicrobial activities of *Achillea odorata Subsp. pectinata* and *Ruta Montana* essential oils and their potential use as food preservatives. Foods 9 (668): 1-17. doi: 10.3390/foods9050668.

Benarba B, Belabid L, Righi K, Bekkar AA, Elouissi M, Khaldi A, Hamimed A. 2015. Ethnobotanical study of medicinal plants used by traditional healers in Mascara (North West of Algeria). Journal of Ethnopharmacology 175: 626-637.

Bencheikh N, Elbouzidi A, Kharchoufa L, Ouassou H, Merrouni IA, Mechchate H, Es-safi I, Hano C, Addi M, Bouhrim M, Eto B, Elachouri M. 2021. Inventory of Medicinal Plants Used Traditionally to Manage Kidney Diseases in North-Eastern Morocco: Ethnobotanical Fieldwork and Pharmacological Evidence 10: 1966. doi: 10.3390/plants10091966.

Benítez G. 2010. Pharmaceutical ethnobotany in the western part of Granada province (southern Spain): Ethnopharmacological synthesis. Journal Ethnopharmacology 129 : 87-105.

Benlamdini N, Elhafian M, Rochdi A, Zidane L. 2014. Etude floristique et ethnobotanique de la flore médicinale du haut Atlas oriental (Haute Moulouya). Journal of Applied Biological Science 78 : 6771-6787. doi: 10.4314/ jab.v78i1.17.

Bennacer A, Sahir-Halouane F, Aitslimane-Aitkaki S, Oukali Z, Oliveira IV, Rahmouni N, Aissaoui M. 2022. Structural characterization of phytochemical content, antibacterial, and antifungal activities of *Juglans regia* L. leaves cultivated in Algeria. Biocatalysis and Agricultural Biotechnology. 40: 102304. doi: 10.1016/j.bcab.2022.102304.

Bhattarai S, Chaudhary RP, Taylor RS. 2009. Wild edible plants used by the people of Manang district, central Nepal. Ecology of Food and Nutrition. 48: 1-20. doi: 10.1080/03670240802034996.

Blumenthal M, Busse WR. 1998. The Complete German Commission E monographs: Therapeutic Guide to Herbal Medicines. Austin, TX: The American Botanical Council.

Boonyanit T, Sroisiri T, Minh TD. 2011. Fermentation of various sugars and sugar substitutes by oral microorganisms. Asian Pacific Journal of Tropical Biomedicice. 1 (2): S258-S260. doi: 10.1016/S2221-1691(11)60166-4.

Borba AM, Macedo M. 2006. Plantas medicinais usadas para a saúde bucal pela comunidade do bairro Santa Cruz, Chapada dos Guimarães, MT, Brasil. Acta Botanica Brasilica. 20: 771-782.

Boudjelal A, Henchiri C, Sari M, Sarri D, Hendel N, Benkhaled A, Ruberto G. 2013. Herbalists and wild medicinal plants in M'Sila (North Algeria): an ethnopharmacology survey. Journal of Ethnopharmacology. 148: 395- 402. doi: 10.1016/j.jep.2013.03.082.

Bramantoro T, Hariyani N, Setyowati D, Purwanto B, Zulfiana AA, Irmalia WR. 2020. The impact of oral health on physical fitness: A systematic review. Heliyon. 6: e03774. doi: 10.1016/j.heliyon. 2020.e03774.

Büntzel J, Micke O, Büntzel J. 2021. How to transfer traditional knowledge about medicinal herbs? or TCM plants: a black box for modern oncologists. Journal of Cancer Research and Clinical Oncology. 147: 351-359 . doi: 10.1007/s00432-020-03415-3.

Caruntu S, Ciceu A, Olah NK, Don I, Hermenean A, Cotoraci C. 2020. *Thuja occidentalis* L. (Cupressaceae): Ethnobotany, Phytochemistry and Biological Activity. Molecules. 25: 5416. doi: 10.3390/molecules25225416.

Chekole G. 2017. Ethnobotanical study of medicinal plants used against human ailments in Gubalafto District, Northern Ethiopia. Journal of ethnobiollogy and ethnomedecine. 13: 55.

Chermat S, Gharzouli R. 2015. Ethnobotanical Study of Medicinal Flora in the North East of Algeria - An Empirical Knowledge in Djebel Zdimm (Setif). Journal of Materials Science and Engineering A. 5 (1-2): 50-59. doi: 10.17265/2161-6213/2015.1-2.007.

Chinsembu KC. 2016. Plants and Other Natural Products Used in the Management of Oral Infections and Improvement of Oral Health. Acta Tropica. (154): 6-18. doi: 10.1016/j.actatropica.2015.10.019.

Chonco WZ. 1972. The African Bantu traditional practice of medicine: some preliminary observations. Social Science and Medecine. 6(3): 283-322. doi: 10.1016/0037-7856(72)90104-7.

Clark AM, Jurgens TM Hufford CD. 1990. Antimicrobial activity of juglone. Phytotherapy Research. 4: 11-14. https://doi.org/10.1002/ptr.2650040104.

Colgrave ML, Kotze AC, Ireland DC, Wang CK, Craik DJ. 2008. The Anthelmintic Activity of the Cyclotides: Natural Variants with Enhanced Activity. Chembiochem. 9: 1939-1945. doi: 10.1002/cbic. 200800174.

Cruz Martínez C, Diaz Gómez M, Oh MS. 2017. Use of traditional herbal medicine as an alternative in dental treatment in Mexican dentistry: A review. Pharmaceutical Biology. 55: 1992-1998. doi: 10.1080/13880209.2017.1347188.

Daoudi A, Hrouk H, Belaid R, Slimani I, Ibijbijen J, Nassiri L. 2016. Valorization of *Ruta montana* and *Ruta chalepensis*: ethnobotanical study, phytochemical screening and antibacterial activity. Journal of Materials and Environmental Science. 7(3): 926-935.

Das S, Rani R. 2013. Antioxidant and gastroprotective properties of the fruits of *Thuja occidentalis*, Linn. Asian Journal of Biochemical and Pharmaceutical Research. 3: 80-87.

Devkota HP, Logesh R, Das N. 2022. Chapter 11 - Health-promoting activities of clove (*Syzygium aromaticum*). In: Clove (*Syzygium aromaticum*), Editor(s): Ramadan, M.F., Academic Press, 195-201. doi: 10.1016/B978-0-323-85177-0.00009-4.

Djenba S. 2015. Influence des paramètres: géologique, géomorphologique et hydrogéologique sur le comportement mécanique des sols de la Wilaya de Setif, Algerie. Thèse de Doctorat en Sciences : Option Sciences Hydrauliques. Université Mohamed Khider. Biskra, 196 p.

Dobignard A. Chatelain C. 2010-2013. Index synonymique de la Flore d'Afrique du Nord.

Dubey SK, Barta A. 2008. Antidiabetic activity of *Thuja occidentalis* Linn. Research Journal of Pharmacy and Technology. 1: 362-365.

Dubey SK, Batra A. 2009. Role of phenolics in anti-atherosclerotic property of *Thuja occidentalis* Linn. Ethnobotanical Leaflets. 13: 791-800.

Eddouks M, Bidi A, El Bouhali B, Hajji L, Zeggwagh NA. 2014. Antidiabetic plants improving insulin sensitivity. The Journal of Pharmacy and Pharmacology. 66: 1197-1214.

Eley BM. 1999. Antibacterial agents in the control of supragingival plaque-a review. British Dental Journal 186(6), 286-96. doi: 10.1038/sj.bdj.4800090.

El-Gazar AA, Emad AM, Ragab GM, Rasheed DM. 2022. *Mentha pulegium* L. (Pennyroyal, Lamiaceae) Extracts Impose Abortion or Fetal-Mediated Toxicity in Pregnant Rats; Evidenced by the Modulation of Pregnancy Hormones, MiR-520, MiR-146a, TIMP-1 and MMP-9 Protein Expressions, Inflammatory State, Certain Related Signaling Pathways, and Metabolite Profiling via UPLC-ESI-TOF-MS. Toxins. 16;14(5):14: 347. doi :10.3390/toxins14050347.

El-Ghazouani F, El-Ouahmani N, Teixidor-Toneu I, Yacoubi B, Zekhnini AA. 2021. Survey of medicinal plants used in traditional medicine by women and herbalists from the city of Agadir, southwest of Morocco. European Journal of Integrative Medecine. 42:101284. doi: 10.1016/j.eujim.2021.101284.

Elolemy AT, AlBedah AM. 2012. Public knowledge, attitude and practice of complementary and alternative medicine in Riyadh region, Saudi Arabia. Oman Medical Journal. 27: 20-26. doi: 10.5001/omj.2012.04.

Erazo D, Whetstone DR. 2022. Dental Infections. [Updated 2022 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan- Available from: https://www.ncbi.nlm.nih.gov/books/NBK542165/

Fatima A, Ahmad M, Zafa M, Ghulam Y, Pukhtoon Zada Khan M, Akram Butt M, Sultana S. 2018. Ethnopharmacological relevance of medicinal plants used for the treatment of oral diseases in Central Punjab-Pakistan. Journal of Herbal Medecine 12: 88-110. doi: 10.1016/j.hermed.2017.09.004.

Friedman J, Yaniva Z, Dafnib A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. Journal of Ethnopharmacology 16: 275-87. doi: 10.1016/0378-8741(86)90094-2.

Gebeyehu G, Asfaw Z, Enyew A, Raja N. 2014. Ethnobotanical study of traditional medicinal plants and their conservation status in Mecha Wereda West Gojjam Zone of Ethiopia. International Journal of Pharmaceuticals and Health Caire Research 3: 137-54.

Gokdogan O, Catli T, Ileri F. 2015. Halitosis in oto-rhino-laryngology practice. Iran Journal of Otorhinolaryngol. 27: 145-53.

Guedje NM, Ntungwen Fokunang C, Tafokou Jiofack RB, Fogou Dongmo R. 2010. Opportunités d'une exploitation soutenue des plantes médicinales dans l'aménagement forestier. International Journal of Biological and Chemical Sciences. 4: 1346-1372. doi: 10.4314/ijbcs.v4i4.63070.

Halabi AA, Elwakil BH, Hagar M, Olama ZA. 2022. Date Fruit (*Phoenix dactylifera* L.) Cultivar Extracts: Nanoparticle Synthesis, Antimicrobial and Antioxidant Activities. Molecules. 27 : 5165. doi: 10.3390/ molecules27165165.

Hammami I, Smaoui S, Ben Hsouna A, Hamdi N, Triki MA. 2015. *Ruta montana* L. leaf essential oil and extracts: characterization of bioactive compounds and suppression of crown gall disease. EXCLI Journal. 14: 83-94. doi: 10.17179/excli2014-655.

Handa S, Khanuja S, Longo G, Rakesh D. 2008. Extraction Technologies for Medicinal and Aromatic Plants; International Centre for Science and High Technology: Trieste, Italy, pp. 21-25.

Harbane S, Lamouri L, Bouazza B, Pescatore KA. 2023. Medicinal plants used for the treatment of cancer in Algeria: an ethnomedicinal survey. Vegetos. 36, 442–452. doi: 10.1007/s42535-022-00445-9.

Harouak H, Falaki K, Bouiamrine E, Oudija F, Ibijbijen J, Nassiri L. 2018. Ethnobotanical survey of plants used in treatment of oral diseases in the city of Meknes, Morocco. International Journal of Herbal Medecine. 6: 46-49.

Heinrich M, Ankli A, Frei B, Weimann C, Sticher O. 1998. Medicinal plants in Mexico: Healer's consensus and cultural importance. Social Science and Medecine. 47: 91-112.

Hosseini SH, Sadeghi Z, Hosseini SV, Rainer W. 2022. Bussmann, Ethnopharmacological study of medicinal plants in Sarvabad, Kurdistan province, Iran, Journal of Ethnopharmacology. 288: 114985. doi: 10.1016/j.jep.2022.114985.

Howard P. 2003. The Major Importance of 'minor' Resources: Women and Plant Biodiversity (International Institute for Environment and Development (IIED), London.

Ishurda O, John FK. 2005. The anti-cancer activity of polysaccharide prepared from Libyan dates (Phoenix dactylifera L.). Carbohydrate Polymers. 59: 531-535. doi: 10.1016/j.carbpol.2004.11.004.

Jahan N, Ahmad M, Mehjabeen Zia-ul-haq M, Alam SM, Qureshi M. 2010. Antimicrobial screening of some medicinal plants of Pakistan. Pakan Journal of Botany 42: 4281-4284.

Juárez-Reyes K, Brindis F, Medina-Campos ON, Pedraza-Chaverri J, Bye R, Linares E, Mara R. 2015. Hypoglycemic, antihyperglycemic, and antioxidant effects of the edible plant Anoda cristata. Journal of Ethnopharmacology. 161: 36-45. doi: 10.1016/j.jep.2014.11.052

Kashkooe A, Sardari FA, Mehrabadi MM. 2021. A Review of Pharmacological Properties and Toxicological Effects of *Adiantum capillus-veneris* L. Current Drug Discovery Technologies. 18: 2. doi: 10.2174/1570163817666200316111445

Kankara SS, Ibrahim MH, Mustafa M, Go R. 2015. Ethnobotanical survey of medicinal plants used for traditional maternal healthcare in Katsina state, Nigeria. South African Journal of Botany. 97: 165-175. doi: 10.1016/j.sajb.2015.01.007.

Kayani S, Ahmad M, Sultana S, Shinwari ZK, Zafar M, Yaseen G, Houssain M, Bibi T. 2015. Ethnobotany of medicinal plants among the communities of Alpine and Sub-alpine regions of Pakistan. Journal of Ethnopharmacology. 164: 186-202. doi: 10.1016/j.jep.2015.02.004.

Khabbach A, Libiad M, Ennabili A, Bousta D. 2012. Medicinal and cosmetic use of plants from the province of Taza, Northern Morocco. Boletín Latinoamericano y del Caribe de Plantas Medicinales y Aromáticas. 1 : 46- 60.

Kidane B, Van Ande T, Josephus L, Van der Maesen G, Asfaw Z. 2014. Use and management of traditional medicinal plants by Maale and Ari ethnic communities in southern Ethiopia. Journal of Ethnobiology and Ethnomedecine 10: 46. Doi: 10.1186/1746-4269-10-46.

Kumar G, Jalaluddin M, Rout P, Mohanty R, Dileep CL. 2013. Emerging trends of herbal care in dentistry. Journal of Clinical and Diagnostic Research. 7(8): 1827-1829. doi: 10.7860/JCDR/2013/6339.3282.

Lamorde M, Tabuti JRS, Obua C, Kukunda-Byobona C, Lanyero H, ByakikaKibwika P, Bbos, GS, Lubega A, Ogwal-Okeng J, Ryan M, Waako PJ, Merry C. 2010. Medicinal plants used by traditional medicine practitioners for the treatment of HIV/AIDS and related conditions in Uganda. Journal of Ethnopharmacology 130(1): 43-53. doi: 10.1016/j.jep.2010.04.004

Lanka J, Kumar S. 2022. Evaluation of Therapeutic Benefits of a Novel Herbal Ingredient-Based Hyaluronic Acid Gel as Monotherapy for Inflammatory Enlargement of a Patient with Diabetes Mellitus. Case Report in Dentistry. 4872959. doi: 10.1155/2022/4872959.

Li CL, Huang HL, Wang WC, Hua H. 2016. Efficacy and safety of topical herbal medicine treatment on recurrent aphtous stomatitis: A systematic review. Drug Design Development and Therapy. 10: 107-115. Doi: 10.2147/DDDT.S96589

Lima Júnior JF, Vieira LB, Leite MJVF, Lima KCO. 2005. Uso de Fitoterápicos ea Saúde Bucal. Saúde Revista. 7: 11-17.

Liu J. 2008. Simultaneous determination of three diarylheptanoid and an alfa-tetralone derivative in the green walnut husks (*Juglans regia* L.) by high performance liquid chromatography with photodiode array detector. Journal of Chromatography. A. (1190), (1-2):80-85. doi: 10.1016/j.chroma.2008.02.083.

Macfarlane TV, Kawecki MM, Cunningham C, Bovaird I, Morgan R, Rhodes K, Watkins, R. 2011. Mouthwash use in general population: results from adult dental health survey in grampian, Scotland. Journal of Oral and Maxillofacial Research. 1;1(4) : e2. doi: 10.5037/jomr.2010.1402.

Madani S, Djamel S, Noui H, Amel B. 2012. Ethnobotanical study of therapeutic plants used to treat arterial hypertension in the Hodna region of Algeria. Global Journal of Research on Medicinal Plants Indigenous Medecine (1):7.

Madiba M, Oluremi BB, Gulube Z, Oderinlo OO, Marimani M, Osamudiamen PM, Patel M. 2023. Anti-*Streptococcus mutans*, anti-adherence and anti-acidogenic activity of Uvaria chamae P. Beauv, Journal of Ethnopharmacology. 300: 115673. doi: 10.1016/j.jep.2022.115673.

Mahmood A, Mahmood A, Malik RN. 2012. Indigenous knowledge of medicinal plants from Leepa valley, Azad Jammu and Kashmir, Pakistan. Journal of Ethnopharmacology. 143: 338-346. doi: 10.1016/j.jep.2012.06.046.

Mahomoodally MF. 2013. Traditional medicines in Africa: An Appraial of ten potent African Medicinal plants. Evidence.-Based Complementary and Alternative Medecine. 2013;2013:617459. doi: 10.1155/2013/617459 1-14.

Majdoub S, Dall'Acqua S, El Mokni R, Hammami S, Peron G. 2022. Chemical Composition and Antioxidant Activity of Essential Oil from the Aerial Parts of *Teucrium luteum* (Mill.) Degen subsp. *flavovirens* (Batt.) Greuter & Burdet Growing Wild in Tunisia. Applied Science. 12: 7370. doi: 10.3390/app12157370

Mak KK, Day JR. 2011. Dental health behaviours among early adolescents in Hong Kong. International Journal of Dental Hygiene. 9(2): 122-126. doi: 10.1111/j.1601-5037.2010.00452.x.

Maphetu N, Unuofin JO, Masuku NP, Olisah C, Lebelo SL. 2022. Medicinal uses, pharmacological activities, phytochemistry, and the molecular mechanisms of *Punica granatum* L. (pomegranate) plant extracts: A review Biomedicine and Pharmacotherapy. 153:113256. doi: 10.1016/j. biopha. 2022. 113256

Marchelak A, Owczarek A, Matczak M, Pawlak A, Kolodziejczyk-Czepas J, Nowak P, Olszewska MA. 2017. Bioactivity Potential of *Prunus spinosa* L. Flower Extracts: Phytochemical Profiling, Cellular Safety, Pro-inflammatory Enzymes Inhibition and Protective Effects Against Oxidative Stress *In Vitro*. Frontier Pharmacology. 8: 680. doi: 10.3389/fphar.2017.00680.

Meddour R, Meddour-Sahar O. 2015. Medicinal plants and their traditional uses in Kabylia (Tizi Ouzou, Algeria). Arabian Journal Medicinal and Aromatic Plants. 2: 137-151.

Meddour R, Mellal H, Meddour-Sahar O, Derridj A. 2009. La Flore Médicinale et ses Usages Actuels en Kabylie (wilaya de Tizi Ouzou, Algérie) : Quelques Résultats d'une Etude Ethnobotanique. Revue des Régions Arides, n° Spécial, 181-201.

Mehdioui R, Kahouadji A. 2007. Etude Ethnobotanique Auprès de la Population Riveraine de la Forêt d'Amsittène: Cas de la Commune d'Imi n'Tlit (Province d'Essaouira). Bulletin de l'Institut Scientifique, Rabat, Section Sciences de la Vie 29, pp. 11-20.

Moran JM. 2000. Home-use oral hygiene products: mouthrinses. Periodontology 2000. 48: 42-53. doi: 10.1111/j.1600-0757.2008.00260.x.

Mosaddegh M, Naghibi F, Moazzeni H, Pirani A, Esmaeili S. 2012. Ethnobotanical survey of herbal remedies traditionally used in Kohghiluyeh va Boyer Ahmad province of Iran. Journal of Ethnopharmacology. 141: 80-95. doi: 10.1016/j.jep.2012.02.004.

Mujoriya R, Bodla RB. 2012. A study on wheat grass and its nutritional value. Food Science and Quality Management. 2:1-8.

Najem M, Harouak H, Ibijbijen J, Nassiri L. 2020. Oral disorders and ethnobotanical treatments: A field study in the central Middle Atlas (Morocco). Heliyon 6(8): e04707. doi: 10.1016/j. heliyon. 2020 .e0 4707.

Naseer A, Javeria F, Sultan AM, Farooq P. 2022. Role of *Phoenix dactylifera* (Ajwa) on lipid profile; a randomized controlled trial, Journal of King Saud University - Science, (34) 4: 101959, doi: 10.1016/j.jksus.2022.101959.

Nasrollahi1 I, Talebi E, Bashardoost Z. 2022. *In-vitro* study of chemical composition, antimicrobial and antioxidant properties of *Adiantum capillus-veneris* L. essential oil. doi: 10.20944/preprints202207.0214.v1.

Nazir MZ, Chandel S, Sehgal A. 2016. *In vitro* screening of antioxidant potential of Thuja occidentalis. Journal of Chemical and Pharmaceutical Science. 8: 283-286.

Orch H, Douira A, Zidane L. 2015. Étude ethnobotanique des plantes médicinales utilisées dans le traitement du diabète, et des maladies cardiaques dans la région d'Izarène (Nord du Maroc). Journal of Applied Bioscience. 86: 7940-7956.

Otunola GA. 2021. Culinary Spices in Food and Medicine: An Overview of *Syzygium aromaticum* (L.) Merr. and L. M. Perry [Myrtaceae]. Frontier Pharmacology. 12: 793200. doi: 10.3389/fphar.2021.793200.

Ouelbani R, Bensari S, Nardjes Mouas T, Khelifi D. 2016. Ethnobotanical investigations on plants used in folk medicine in the regions of Constantine and Mila (Northeast of Algeria). Journal of Ethnopharmacology 194: 196-218. doi: 10.1016/j.jep.2016.08.016.

Ould El-Hadj MD, Hadj-Mahammed M, Zabeirou H. 2003. Place of the spontaneous plants samples in the traditional pharmacopoeia of the area of Ouargla (Septentrional east Sahara). Courrier du Savoir. 3: 47-51.

Ozenda P. 1977. Flore du Sahara. Ed CNRS, Paris, p. 622.

Palombo EA. 2011. Traditional medicinal plant extracts and natural products with activity against oral bacteria: potential application in the prevention and treatment of oral diseases. Evidence- Based Complementary and Alternative Medecine. 680354. doi: 10.1093/ecam/nep067.

Panth N, Paudel KR, Karki R. 2016. Phytochemical profile and biological activity of *Juglans regia*. *Journal of* Integrated Medecine. 14(5): 359-373.

Peršuric Ž, Martinovic LS, Malenica M,, Gobin I, Pedisic S, Dragovic-Uzelac V, Kraljevic Pavelic S. 2020. Assessment of the Biological Activity and Phenolic Composition of Ethanol Extracts of Pomegranate (*Punica granatum* L.) Peels. Molecules. 25: 5916. doi: 10.3390/molecules25245916.

Petersen PE. 2009. Global policy for improvement of oral health in the 21st century implications to oral health research of World Health Assembly 2007, World Health Organization. Commun. Dental Oral Epidemiology 37(1): 1-8. doi: 10.1111/j.1600-0528.2008.00448.x .

Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day E, Ndiaye C. 2005. The global burden of oral diseases and risks to oral health. Bulletin of World Health Organisation 83(9): 661-669.

Pfeiffer JM, Butz RJ. 2005. Assessing cultural and ecological variation in ethnobiological research: the importance of gender. J.ournal of Ethnobiology. 25: 240-278.

Puri A, Sahai R, Singh KL, Saxena RP, Tandon JS, Saxena KC. 2000. Immunostimulant activity of dry fruits and plant materials used in Indian traditional medical system for mothers after child birth and invalids. Journal Ethnopharmacology 71: 89-92. doi: 10.1016/S0378-8741(99)00181-6.

Polat R, Satıl F. 2012. An ethnobotanical survey of medicinal plants in Edremit Gulf (Balıkesir–Turkey). Journal of Ethnopharmacol. 139 : 626–641. doi: 10.1016/j.jep.2011.12.004.

Quezel P, Santa S. 1962. 63. Nouvelle flore de l'Algérie et des régions désertiques méridionales Vol. 2 CNRS (Ed) Paris, 1170 p.

Ranjarisoa LN, Razanamihaja N, Rafatro H. 2016. Use of plants in oral health care by the population of Mahajanga, Madagascar. Journal of Ethnopharmacology. 193: 179-194. doi: 10.1016/j.jep.2016.07.076.

Rebbas K, Bounar R, Gharzouli R, Ramdani M, Djellouli Y, Alatou D. 2012. Plantes d'intérêt médicinale et écologique dans la région d'Ouanougha (M'sila, Algérie). Phytothérapie. 10(2) : 131-142. doi :10.1007/s10298-012-0701-6.

Saafi EB, Louedi M, Elfeki A, Zakhama A, Najjar MF, Hammami M, Achour L. 2011. Protective effect of date palm fruit extract (*Phoenix dactylifera* L.) on dimethoate induced-oxidative stress in rat liver. Experimental and Toxicological Pathology. 63: 433-441. doi: 10.1016/j.etp.2010.03.002.

Sagar NA, Pareek S, Bhardwaj R, Vyas N. 2020. Bioactive Compounds of Loquat (*Eriobotrya japonica* (Thunb.) L.). In: Murthy, H., Bapat, V. (eds) Bioactive Compounds in Underutilized Fruits and Nuts. Reference Series in Phytochemistry. Springer, Cham. doi: 10.1007/978-3-030-30182-8_10.

Saha S, Bhattacharjee P, Mukherjee S, Mazumdar M, Chakraborty S, Khurana A, Nayak D, Manchanda R, Chakrabarty R, Das T. 2014. Contribution of the ROS-p53 feedback loop in thuja induced apoptosis of mammary epithelial carcinoma cells. Oncology Reports. 31: 1589-1598. doi.:10.3892/or.2014.2993.

Salem MZM, Behiry SI, Salem AZM. 2018. Effectiveness of root-bark extract from *Salvadora persica* against the growth of certain molecularly identified pathogenic bacteria. Microbial Pathogenesis. 117:320-326. doi: 10.1016/j.micpath.2018.02.044.

Salhi S, Fadli M, Zidane L, Douira A. 2011. Etudes floristique et ethnobotanique des plantes médicinales de la ville de Kénitra (Maroc). Lazaroa. 31: 133-143.

Santos EB, Dantas GS, Santos HB, Diniz MFFM, Sampaio FC. 2009. Estudo etnobotânico de plantas medicinais para problemas bucais no município de João Pessoa, Brasil. Brazilian Journal of Pharmacognosy. 19: 321-324.

Sargin SA, Selvi S, Büyükcengiz M. 2015. Ethnomedicinal Plants of Aydincik District of Mersin, Turkey. Journal of Ethnopharmacology. 174: 200-216. doi: 10.1016/j.jep.2015.08.008.

Sharifi-Rad M, Epifano F, Fiorito S, Álvarez-Suarez JM. 2020. Phytochemical analysis and biological investigation of *Nepeta juncea* Benth. different extracts. Plants. 9: 646. doi: 10.3390/plants9050646 .

Sher H, Al-yemeni MN, Wijaya L. 2011. Ethnobotanical and antibacterial potential of *Salvadora persica* L.: a well known medicinal plant in Arab and Unani system of medicine. Journal of Medicine Plants Research. 5 (7): 1224- 1229.

Shraideh ZA, Abu-Elteen KH, Sallal AK. 1998. Ultrastructural effects of date extract on *Candida albican*s. Mycopatholpgy. 142: 119-123 doi: 10.1023/A:1006901019786.

Silva IS, Nicolau LAD, Sousa FBM, de Araújo S, Oliveira AP, Araújo TSL, Souza LKM, Martins CS, Aquino PEA, Carvalho LL, 2017. Evaluation of anti-inflammatory potential of aqueous extract and polysaccharide fraction of *Thuja occidentalis* Linn. in mice. International Journal of Biological Macromolecules 105: 1105-1116.

Sinha DJ, Sinha AA. 2014. Natural medicaments in dentistry. Ayu. 35: 113-118. doi: 10.4103/0974-8520.146198.

Sunila ES, Kuttan G. 2005. Protective effect of *Thuja occidentalis* against radiation induced toxicity in mice. Integrative Cancer Therapies. 4: 322-328. doi: 10.1177/1534735405282251.

Taheri JB, Azimi S, Rafieiann N, Zanjani HA. 2011. Herbs in dentistry. International Dental Journal. 61 (6): 287-296. doi: 10.1111/j.1875-595X.2011.00064.x.

Takahashi N, Nyad B. 2011. The role of bacteria in the caries process: ecological perspectives. Journal of Dental Research. 90(3): 294-303. doi: 10.1177/0022034510379602.

Tegtmeier M, Harnischfeger G. 1994. Die Abhängigkeit des Thujongehaltes vom Extraktionsverfahren bei Zubereitungen aus Thujae herba. Pharmazie. 49: 56-58.

Teixeira B, Marques A, Ramos C, Batista I, Serrano C, Matos O, Neng NR, Nogueira JM, Saraiva JA, Nunes ML. 2012. European pennyroyal (*Mentha pulegium*) from Portugal: Chemical composition of essential oil and antioxidant and antimicrobial properties of extracts and essential oil. Industrial Crops and Products. 36: 81-87.

Telli A, Esnault MA, Ould El Hadj Khelil A. 2016. An ethnopharmacological survey of plants used in traditional diabetes treatment in south-eastern Algeria (Ouargla province). Journal of Arid Environnement. 127: 82-92. doi: 10.1016/j.jaridenv.2015.11.005.

Tonzetich J. 1978. Oral malodour: An indicator of health status and oral cleanliness. International Dental Journal. 28: 309-19.

Topalov VD. 1989. “Mentha,” in Crop Production, Topalov MS, Dechev VD, Pehlivanov II, Eds., pp. 372-381, Zemizdat Press, Sofia, Bulgaria, 1989.

Torres A, Vargas Y, Urib, D, Carrasco C, Torres C, Rocha R, Oyarzun C, Martin RS, Quezada C. 2016. Pro-apoptotic and anti-angiogenic properties of the α/β-thujone fraction from *Thuja occidentalis* on glioblastoma cells. Journal of Neurooncology. 128: 9-19.

Tutin TG, Heywood VH, Burges NA, Moore DH, Walters SM, Webb DA. 1968. Flora Europea. Vol. 2. Cambridge: Cambridge University Press.

Verma J, Gautam S. 2016. Antimutagenic potential of date palm (*phoenix dactylifera*) fruit aqueous extract in suppressing induced mutagenesis and purification of its bioactive constituent. MOJ Food Processing and Technology. 2(5): 179-185. Doi: 10.15406/mojfpt.2016.02.00053.

Verpoorte R, Choi Y, Kim H. 2005. Ethnopharmacology and systems biology: a perfect holistic match. Journal Ethnopharmacology. 100: 53-56. doi: 10.1016/j.jep.2005.05.033.

Vuletic M, Jakovljevic V, Zivanovic S, Papic M, Papic M, Mladenovic R, Zivkovic V, Srejovic I, Jeremic J, Andjic M. 2022. The Evaluation of Healing Properties of *Galium verum*-Based Oral Gel in Aphthous Stomatitis in Rats. Molecules. 27: 4680. doi: 10.3390/molecules27154680.

Watt RG. 2005. Strategies and approaches in oral disease prevention and health promotion. Bull. World Health Organisation 83(9): 711-718.

Zahara E. 2022. "The Use of Distance Fences In Reducing Dental Pain in The Community of the Bireuen District ". Science Midwifery. 10(3): 2211-2214. doi: 10.35335/midwifery.v10i3.640.

Zia Q, Rehman MT, Hashmi MA, Siddiqui S, Bin Dukhyil A, Ahmed MZ, Jamal A, Banawas S, Almalki SG, Owais M, Aldhafeeri HQ, Ibrahim IM, Alturaiki W, AlAjmi MF, Alsieni M, Alqurashi YE. 2022. Effect of Date Palm (*Phoenix dactylifera*) Phytochemicals on Aβ1−40 Amyloid Formation: An in-silico Analysis. Frontier Neurosciences. 16: 915122. doi: 10.3389/fnins.2022.915122.

Ziyyat, A, Legssyer A, Mekhfi H, Dassouli A, Serhrouchni M, Benjelloun W. 1997. Phytotherapy of hypertension and diabetes in oriental Morocco. Journal of ethnopharmacology. 58(1): 45-54.

Zougagh S, Belghiti A, Rochd T, Zerdani I, Mouslim J. 2018. Medicinal and Aromatic Plants Used in Traditional Treatment of the Oral Pathology: The Ethnobotanical Survey in the Economic Capital Casablanca, Morocco (North Africa). Natural Products and Bioprospecting. 9: 35-48. doi: 10.1007/s13659-018-0194-6.