

**ETHNOPHARMACOLOGICAL SURVEY OF SOME LIBYAN MEDICINAL PLANTS  
GROWING WILD IN ALJABALALAKHDAR****A. Aljaiyash<sup>1\*</sup>, Amna Hussein Lasema<sup>1</sup>, Noor Al-huda Abd El-mene'm Altrekey<sup>1</sup> and Rayan Ahmed Eltalhi<sup>1</sup> and  
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**ABSTRACT**

For years, Libyan herbalists have been using traditional plant-based medicines; however, most of these traditional healers misuse their use because of the limited information about harmful side effects. The traditional healers prescribe recipes that do not comply with any quality standard. This study was designed and initiated in an effort to classify and shortlist some reported medicinal plants used by traditional healers in the east part of Libya. Data from this work was obtained by collecting semi-interviews and direct questionnaires from local traditional healers. This study targeted herbalists in the city of Al-Bayda. A total of 20 of the identified plant species belonged to 14 botanical families, and number of recipes has been selected and studied in this project. The most plant species used in recipes by herbalists were *Rosmarinus officinalis* L. and *Matricaria chamomilla* respectively. The most represented family is that of Lamiaceae with 5 species, followed by that of Asteraceae with 3 species. The preparations were obtained either from a mixture of two plant species (with 10%), or from a mixture of three (with 15%), mixture of four (with 20%) and five for 2 recipes (with 25%). In the other hand, a list of some plant species used by traditional healers was presented as a single recipe, explaining the ways of using them, the parts of the plant used and the therapeutic applications.

**KEYWORDS:** Medicinal plants; Pharmacopoeia; Ethnopharmacology; Traditional healers; Aljabal Alakhdar; Libya.**1. INTRODUCTION**

During the last century, aromatic and medicinal plants (MAPs) and their products have been used extensively for therapeutic and several purposes, and have attracted world-wide interest due to the growing recognition of natural products and the potential for drug discovery (Hamilton, 2003). These plants have been the subject of several studies, and they are still being evaluated and experimented, to find new natural active substances able to substituting synthetic products widely used in the pharmaceutical, cosmetics, food and agricultural industries. Many populations around the world rely on MAPs because they are easily available at an affordable price.

Libyan culture, like every other culture in the world, relies to a certain extent on local medicinal plants to treat several kinds of illness. The inhabitants of the Green Mountain (Al-Jabal Al-Akhdar) of Cyrenaica, Libya have used the medicinal plants grown in the region for thousands of years and have, therefore, provided a rich heritage of folk herbal medicine which have survived

through generations (El-Gadi & El-Mughrabi, 1999). The vegetation of Cyrenaica has long been investigated and a detailed description of the flora of Al-Jabal Al-Akhdar has been produced and published over the last three centuries (Lemaire, 1703; Della-Cella, 1819; Pacho, 1827; Beechey & Beechey, 1828; Pampanini, 1931; Simpson & Sandwith, 1941; Boulos, 1972; Brullo & Furnari, 1979; El-Sherif & Singh, 1996; El-Mokasabi, 2014; Alaib et al., 2016; Saaed et al., 2019). Due to their rich vegetation, the floristic composition of the valleys (Wadis) of Al-Jabal Al-Akhdar have lately been devoted special attention; for instance; Wadi Murqus (El-Sherif et al., 1991); Wadi Al-Ashrha (Asker, 1998); Wadi Zaza (El-Barasi et al., 2003); Wadi Al-Kouf (El-Mokasabi, 2014); Wadi Belkaf (Alaib et al., 2016); Wadi Al-Agar (Alaib et al., 2017). However, little is known about the medicinal plants grown in Al-Bayda.

**Thus, our project work is divided into four parts**

The first part of this work is a bibliographic synthesis that will give an overview on the different notions addressed in this study, generalities on aromatic and

medicinal plants, the interest of these plants in Libya and an overview on ethnopharmacological background and plants under investigations.

The second part brings, a cross-sectional descriptive study, for the Information collected according to face to face questionnaires with folk healers, including selected medicinal plant families, which were the most commonly used in folk medicine in the targeted area, scientific name, local name and therapeutic treatment prescribed by the traditional healers. Subsequently, the third part consists to shows a number of recipes of medicinal plants and diseases used by traditional healers in the studied area.

In the fourth part of this work we will proceed to the marketing of these medicinal species recipes in the study area.

Finally, we will present the general conclusions and perspectives from this research.

### 1.1. Aim and objective of the study

Medicinal plants have been for centuries as a therapeutic source for treating wide variety of ailments and have been found to be of immense global importance. In Aljabal Alakhdar region of Libya, traditional medicine is widely used especially in rural areas; this may be due to the cost of conventional drugs. Hundreds of shrubs, trees, and herbal species used as antipyretics, analgesics, diuretics, laxatives, antimicrobial, antidiarrheal, emetics and cardio- tonics in Aljabal Alakhdar. These plants are available and cheap because they grow wildly in nature or cultivated.

For these reasons, this study aimed to collect data from herbalists and traditional healers about the folk herbal remedies, which have been utilized for treatment of various diseases in Aljabal Alakhdar region of Libya and to verify their pharmacological and toxicologicaleffects through literature review.

## 2. Literature Review

### 2.1. Plants as a source of medicine

Plants are major segment of biodiversity. Each plant in the nature is unique not only to be a part of biodiversity but also are unique natural resources for human beings and for their potential utilization, in multifold directions such as medicine, nutraceuticals, perfumery, beverages, fragrances, cosmetics and dyeing industry (Patel, 2015). Many plants have an important role in pharmacological actions and suitable for medicinal purposes. The relationship between plant and humans give rise to plant importance in every safe of life (Sharma et al., 2019).

Evidence exists, indicates that plants have been used as drugs approximately 60,000 years ago (Kumar et al., 2018). Scripts about medicinal plants date back to almost 5000 years ago in India, China and Egypt, and at least 2500 years in Greece and Central Asia (Qui, 2007).

People have turned to natural remedies to cure common ailments and the trend is constantly increasing. Thus, there has been a shift in universal trend from synthetic to herbal medicines, which we can say „Return to Nature“ for the prevention of diseases and ailments (Shakya, 2016). The widespread use of herbal remedies and healthcare preparations obtained from traditional herbs and medicinal plants has been traced to the occurrence of chemical compounds with medicinal properties (Hoareau, 1999), these chemicals are often referred to as “secondary metabolites” or “phytochemicals” of which there are several classes including alkaloids, flavonoids, glycosides, phenols and others (Okwu and Okwu, 2004).

The World Health Organization (WHO) reported that 80% of the world’s population use herbal medicines for some aspect of primary healthcare. Modern pharmacopeia still contains at least 25% drugs derived from plants (Chinelo et al., 2014). According to an estimate, 120 or so plant-based drugs prescribed for use through the world come from just 95 plant species (Kumar et al., 2013). Whereas, Floristic analysis showed that there are about 500,000 plant species on our planet (Kallassy et al., 2017). Of these only about 6% have been screened for biologic activity, and reported that 15% have been evaluated phytochemically (Verpoorte, 2000).

### 2.2. Libyan medicinal plants

The history of plant exploration in Libyan flora dates back to 1703, when Lemaire made some observations about Sylphium which he called selfione (El-Mokasabi, 2017). Sylphium was one of the most famous of medicinal plants which brought great richness to Cyrenaica (Barqah) during remote times. This precious plant which yielded a gum resin was known in Cyrene (Shahat) and exported to neighboring countries because of its mysterious power in curing many diseases. It is obvious that the continuous overexploitation of Sylphium for several centuries led to its scarcity and finally to its disappearance about the fifth century A.D (El-Mokasabi et al., 2018). Scientific studies of the Libyan flora began when the Swedish scientist Joran Rothman (1773-1776) collected many plant samples from western Libya and stored them at the Riks Museum in Sweden (Abugassa and Abunawael, 2012).

Ethnobotany studies showed that there are 2103 plant species in Libya that belong to 856 genera and 155 families. According to literature there are 450 medicinal plants growing in Libya and 208 are recognized and extensively used by Bedouins and local inhabitants in traditional medicine (Agiel and Mericli1, 2017). More than 100 species are extensively used by local people in folk medicine drinks, or chewed fresh or dry, they are used to cure various diseases (El-Gadi and Bshana, 1992).

Medicinal plants, also called medicinal herbs, have been discovered and used in traditional medicine practices

since prehistoric times. Plants synthesize hundreds of chemical compounds for various functions, including defense and protection against insects, fungi, diseases, and herbivorous mammals.

### 2.3. Ethnopharmacology

Ethnobotanical research involves the relationship between human and plants in many aspects of life such as food resources, portion in cosmetics, base in textiles and elements in farming. Ethnopharmacology on the other hand, emphasizes on the pharmacological treatment in general (Rios, 2011).

The science of ethnopharmacology seeks to investigate the medicinal use of natural materials, such as plants, macrofungi, microorganisms, animals, and minerals, by humans, while applying pharmacological, anthropological, and socio-cultural research methods. Various other branches of science may also be involved in this highly interdisciplinary field (Heinrich, 2014; Heinrich and Jäger, 2015). For example, some ethnopharmacologists study how indigenous peoples use plants for the treatment of diseases and healing, and pharmacologically investigate the recorded and collected species in a laboratory or clinical setting regarding their potential medicinal effects. Here, the initial fieldwork stages of research are often closely linked to the scientific discipline of ethnobotany, the study of relationships between plants, culture, and humans (Alexiades and Sheldon, 1996; Martin, 2004; Balick and Cox, 2020).

### 2.4. Role of traditional healers in Libyan community

Traditional healers have played a crucial, but underappreciated, role in preventing and controlling health problems, as well as in meeting many health care needs in Libyan society. 88% of the population in more than 170 WHO member states use traditional medicine (World Health, 2019) and in general, traditional medical entities and providers treat a greater number of patients than biomedical healthcare (World Health, 2019) facilities.

More than 80% of people worldwide receive their health treatment from traditional (non- biomedical) health facilities. Considering the roles of traditional practitioners and healing centers in responding to disease outbreaks (including epidemics) and epidemics is crucial. This need has become even more evident in light of the recent COVID-19 pandemic, which has affected public health at both the local and global levels. This pandemic and its legacy have changed the way healthcare is delivered and how all aspects of life are currently viewed (Lin, Zhao, Gao, Lou, Yang, Musa, 2020).

The benefits of herbal treatment were also health benefits for people who consumed it as medicine; Financial benefits to the people who harvest, process and distribute it for sale; and community-level benefits, such as employment opportunities.

Medicinal plants are widely used as folk medicine in Libya, because they are easily available and cheaper than modern medicines.

Throughout history, every civilization in the world used plants or their derivatives for treatment or prevention of diseases. In Libya as in many other countries, herbal medicines are broadly used in the treatment of wide range of diseases.

### 2.5. Importance of cultivation and using of traditional and herbal Medicines

Medicinal plants represent the most ancient form of medication, used for thousands of years in traditional medicine in many countries around the world. The empirical knowledge about their beneficial effects was transmitted over the centuries within human communities (Khan, 2014).

Natural products play a pivotal role as a source of drug compounds and, currently, a number of modern drugs which are derived from traditional herbal medicine are used in modern pharmacotherapy (Patwardhan, Vaidya, Chorghade, Joshi, 2014).

Traditional herbal medicines are considered to be significant healthcare providers worldwide. Owing to their efficacy, safety, and fewer side effects, these medicines are in great demand across all healthcare issues in developed countries. Most current conventional drugs are chemically synthesized, and some are isolated from medicinal plants for therapeutic use. Various herbal medicines have evolved based on culture and geographic region, and their market has grown substantially in recent years. However, rapid population growth, industrialization, global climate change, over-exploitation, and unscientific use of medicinal plants have led to their endangerment. Many of these precious medicinal plants are currently on the verge of extinction. Therefore, it is crucial to protect plant biodiversity for the sustainable production of plant-derived compounds. Considerable attention needs to be paid to the compilation and documentation of available traditional knowledge of medicinal plant resources. In addition to conserving existing plant resources and quality control of herbal medicines, a detailed biological, phytochemical, and pharmacological investigation of therapeutic herbal compounds is essential for future drug development (Ahmed Hamza Tahir, Zahid Hussain, Hamza Yousuf, Faryal Fazal, Muhammad Abdullah Tahir, Muhammad Kashif 2022).

According to World Health Organization estimate in 1991-2003, 80% of the worldwide imports and exports of MAPs is dominated by only few countries with three international trade centers; Germany, USA and Hong Kong (Lange, 2006). Twelve countries make up 80% of both the exports and the imports from the world market (Table 1). Hong Kong is the most important importer of

MAPs with an annual average import of approximately 59.950 t. It is followed by the USA with an average import of about 51.200 t and Japan with 46.450 t per year. Germany follows on 4th place, importing on average 44.750 t per year. In terms of quantity of MAP material exported, China is the first of the world's top 12 countries of export by an average export of about 150.600 to of MAPs. In the second place we found Hong Kong with an average export of about 55.000 t and India by 40400 t. On the other hand, based on the average net imports of MAPs of all countries in the period 1991-2003 (Fig. 1); Japan is the most important consumer country, followed by the USA, Germany and the Republic of Korea. However, China is the most important supplier of MAPs in the world, followed by India on second place. Within Africa, Egypt and

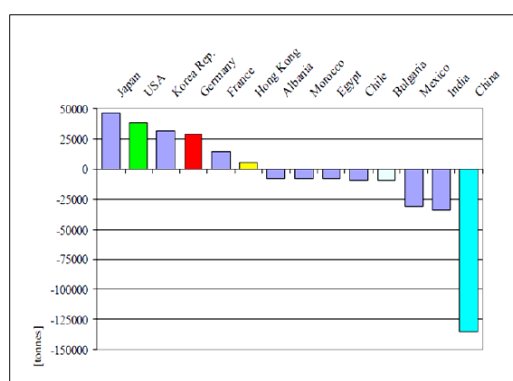
Morocco are the important source countries for MAPs; within Europe, these are Poland, Bulgaria and Albania; and in South America, Chile and Peru (Lange, 2006).

About 80 percent of MAPs supply in the world market is sourced from the wild collections (Vasist and Kumar, 2002). Only a scarce 10% of raw materials result from a cultivated source. The reason lies in lower prices of wild collected plant material when compared to that of cultivated plant material. MAPs in trade consists of mainly fresh or dried plant parts, roots, leaves, bark, wood, flowers, or seeds, or sometimes, is traded as finished products like vegetable oils, essential oils and solvent extracts for food, cosmetics and pharmaceuticals industries.

**Table 1: The world's top 12 leading countries of import and export of MAPs, according to average quantities and values for the period 1991-2003 (Lange, 2006).**

Country of import	Quantity [tonnes]	Value [US\$]	Country of Export	Quantity [tonnes]	Value [US\$]
Hong Kong	59.950	263.484.200	China	150.600	266.038.500
USA	51.200	139.379.500	Hong Kong	55.000	201.021.200
Japan	46.450	131.031.500	India	40.400	61.665.500
Germany	44.750	104.457.200	Mexico	37.600	14.257.500
Rep. Korea	33.500	49.889.200	Germany	15.100	68.243.200
France	21.800	51.975.000	USA	13.050	104.572.000
China	15.550	41.602.800	Egypt	11.800	13.476.000
Italy	11.950	43.006.600	Bulgaria	10.300	14.355.500
Pakistan	10.650	9.813.800	Chile	9.850	26.352.000
Spain	9.850	27.648.300	Morocco	8.500	13.685.400
UK	7.950	29.551.000	Albania	8.050	11.693.300
Malaysia	7.050	38.685.400	Singapore	7.950	52.620.700
<b>Total</b>	<b>320.550</b>	<b>930.524.400</b>	<b>Total</b>	<b>368.100</b>	<b>847.980.800</b>

Source: UNCTAD COMTRADE database (United Nations Statistics Division, New York).



**Figure 1: Average net imports of MAPs of selected countries for the period 1991-2003. The consumer countries are on the left-hand side, the source countries on the right. Source: UNCTAD COMTRADE database (United Nations Statistics Division, New York).**

## 2.6 Traditional Knowledge and Importance of documentation

The importance of traditional knowledge (TK) is known worldwide. Traditional knowledge (TK) denotes and distinguishes a community's way of life or culture and the conceptualise of the indigenous and how people contextual principle applied in daily lives which depends

on the traditional knowledge and the forming of a cultural and spiritual identity which being moulded and passed on verbally from generation to generation and transmitted through many form of art and communication. Other forms of traditional knowledge are expressed through different means (Lim *et al.*, 2010).

Traditional knowledge (TK) gains its recognition to the facts that it contributes to sustainable development. Thousands years of traditional practices had proven to enhance and promote biodiversity at the local level and aid in maintaining a healthy ecosystem. The benefits of TK valued, referred to its function and tasks in the society. TK contributes in industrial growth and industries such as plant-based medicine, health products and cosmetics as well as handicraft (Lim *et al.*, 2010).

Many international bodies such as International Labour Organization (ILO), Food and Agriculture Organization (FAO), United Nations Educational Scientific and Cultural Organization (UNESCO), United Nations Environment Programme (UNEP), North Atlantic Treaty Organization (NATO), the World Bank, United Nations Convention to Combat Desertification (UNCCD), the United Nations Conference on the Environment and Development (UNCED) and The Convention on Wetlands of International Importance (RAMSAR), had accepted TK in pharmaceuticals ground (CBD, 2015). TK had international respect.

WHO (2013) regards the traditional medicine (TM) as important to the society especially in the developing countries, where it may reduce the dominant facts of allopathic medicine being utilize in clinical subject. It is being urged for the developing countries to use the herbal and natural medicine in treatment of patient and consumers in the community. About 80% of the world population use TM to cure various ailments (Brahmachari, 2009; Wangchuk *et al.*, 2011).

### 2.7 Role of traditional knowledge on documentation of medicinal plants in healthcare in Libya

The Ethnobotanical Collection from the Libyan territories of the botanist Alessandro Trotter is included in the Oratio Comes Botanical Museum at the Faculty of Agraria at the University Federico II in Naples. Trotter explored different territories of Libya, mainly Tripolitania, between 1912-1924, collecting plant specimens and the drugs most frequently sold in the markets. The Libyan herbarium currently includes over 2300 sheets of mounted and accessioned plants. The drugs, mostly acquired by Trotter from Tripolitanian markets, were identified and packed in 87 paper sheets or boxes. Trotter added ethnobotanical information for each species when available) Trotter, 1912).

The plants were mainly used for treating various conditions, including mental disorders, skin affections, and injuries, with a focus on the gastrointestinal and respiratory systems. The comparison with recent ethno

pharmacological research in North African countries shows a high correspondence, indicating consistent therapeutic uses over time (Trotter, 1912).

Libya is considered rich in medicinal plants which are used in traditional medicine, especially Cyrenaica, which contains most of the total medicinal plants recorded in Libya (El-Mokasabi, 2014). Although the area of the Al Jabal Al Akhdar constitutes only 1 % of the total area of the Libya, it is characterized by its great plant diversity, which includes more than 50 % of the total plant species spread throughout the entire area of the Libya (Ensaf, Mohammed and Abdelbaset, 2005).

In his study, the researcher (Najat Agiel and Filiz Mericli, 2017) mentioned documenting aromatic plants used in traditional Libya. The medicine should be taken immediately aromatically plants as well as other plant species in Libya are suffering from severe destruction and degradation due to global climate change, overgrazing, uprooting, and The cutting of wood and the reproduction of medicinal and aromatic plants in Libya must be supported.

This allowed us to make a study that aims, particularly, at identifying the traditionally used by traditional healers in albayda city. Preparation methods of different recipes, their mode of use, the duration of the treatment and the rout of administration.

### 3. MATERIALS AND METHODS

For a good realisation of this study, a bibliographical research was associated with the ethnopharmacological investigation realised with traditional healers working in the selected areas in the east of Libya.

This prospective study was done throughout the year 2023. We investigated the city which have the most populations in Aljabal Alakhdar area. This area was chosen because of their accessibility, and the very frequent usage of medicinal plant.

#### 3.1 Study area

The city of Al-Bayda is located in eastern Libya on top of the Green Mountain. It has an area of 11,429 km<sup>2</sup> and is one of the largest cities in Al-Jabal Al-Akhdar. Its population is about 250,978 inhabitant. The city of Al-Bayda is adjacent to many valleys and forests that are not found in the rest of the areas of Al-Jabal Al-Akhdar. These forests contain many medicinal herbs, it is considered one of the best Libyan cities in terms of nature and climate. Figure 22 shows the bio geographical location.



**Figure 22: Bio geographical location.**

### 3.2 Identification of medicinal plants

During this study, all scientific identification of species and local names were conducted by comparing the samples and verified by the herbalists by direct meeting and interviews. Local names of listed species were checked with those recorded in the literature (Bellakhdar, 2017; Sijelmassi, 2003).

### 3.3 Collection of ethnopharmacological data from medicinal plants selected for the survey

Linking local plant names with selected plant samples is one of the major challenges of ethnopharmacological field research (Bennett and Balick, 2014; Rivera *et al.*, 2014).

Table 4 shows a number of recipes of medicinal plants and diseases they treated, these different recipes of medicinal plants used by traditional healers in the studied areas. From the collected data, 6 traditional recipes containing herbal and non-herbal compositions were identified as traditional medicinal approaches that are widely used in Aljabal Alakhdar. According to traditional healers, the most commonly used recipes were for weight gain and for weight loss.

Therefore, the questionnaires were designed to collect specific information on the traditional use in treatment of various diseases, and gathering data on the totality of ethnopharmacological uses of the studied plants within the study area.

During this study, according to open questionnaires with folk healers, the selected families was the most commonly used in folk medicine in the targeted area. The plants scientific names, and local names were identified based on the analysis works of previous studies deal with the ethnobotanical survey in Libya (El-Darier and El-Mogaspi, 2009; Louhaichi, 2011; E.O.C, 2012; Bidak, 2015; El-Gadi, 1994; Kotb, 1985; Raghav

*et al.*, 2005). And books related to medicinal plants and plants growing in Libya (New Dictionary of Medicinal Plants, Poisonous Plants in Libya, Libyan flora). These families and names were recorded as shown in the Table 3.

### 3.4 Collection data, plant species used in different recipes, modes of preparation, parts used and posology

The ethnobotanic characteristics (usage forms, parts of the plant used, treatment periods, problems treated,...) and ethnopharmacological (usage modes, solvent used, usage precautions,...), are indicated in Table 4 in the result chapter which shows the different information that was collected in a preestablished questionnaire (Annex 1).

While Table 5 shows the list of plant species used in different recipes, modes of preparation and posology.

## 4. RESULTS AND DISCUSSION

Ethnobotanical data were collected and gathered in a database for treatment, analysis and visualisation. Among many interviewed male and female healers, there are only 3 that have agreed to provide information.

### 4.1. Healers sociodemographic status

In the demographic data among this study, three informants participated in the study; all were rural traditional healers and all are males. The distribution of respondents in accordance to their gender is shown in Table 2. This study targeted 3 herbalists in the city of Al-Bayda, their ages ranged between 40-80 years old, their marital status were married, and their educational levels varies between basic education and university level. The informants live and practice traditional medicine in a total of different villages, small towns or communities within the study area.

**Table 2: Healers demographic data.**

Characteristics	N=3
Age	More than or >40<less than 80
Gender (n, %)**	(3)
Male Female	(0)
Situation (n, %)**	(0)
Single Married	(3)
Level of study (n, %)**	(1)
Illiterate Primary	(2)
Secondary University	
Residence (n,%)**	Aljable Alakhdar(AL Bayda)

\*\* (n,%): Effective(Percentage).

### 3.2 Medicinal plants and their families selected in the study area

The present study has shown a good diversity of plants identified and used in recipes in the east of Libya, in the area of Albayda city, which are presented in Table 3 and fig. 23. It shows that 20 species of plants divided into 14 botanical families were identified. The most represented family is that of Lamiaceae with 5 species, followed by that of Asteraceae with 3 species. These results show some similarities with the study of Rhattas *et al.* (2016), realized in the north of Morocco, and the study Hanaa Labiad *et al.* (2020) in Chefchaoun in Morocco, in which the most represented families were the Lamiaceae and Asteraceae.

The collected data shows that the most plant use in

recipes (*Rosmarinus officinalis* L.) Renaissance herbals recommend Rosemary for diverse purposes, as a digestive and carminative, for wound healing, respiratory disorders, to enhance memory and others.

These results show some similarities with the study of (Schmid, 2006).

Then comes the second most used plant in recipes (*Matricaria chamomilla*). *Matricaria chamomilla* is used as an herbal remedy for various ailments, including colds and coughs; chest, stomach, and abdominal pain; and sore throat. *Matricaria aurea* is also used as an antispasmodic and analgesic agent. These results show some similarities with the study of (Ali, Yaniv Z, Mahajna, Oran, 2000).

**Table 3: Medicinal plants selected for the ethnopharmacological survey, families and local names in the study area.**

No	Family	Scientific name	Local name
0	Ephedraceae	<i>Ephedra altissima</i> Desf.	Alandi \ margad lefa'a
1	Cupressaceae	<i>Juniperus phoenicea</i> L.	Arar
2	Rutaceae	<i>Ruta graveolens</i> L.	Al fajjal
4	Capparaceae	<i>Capparis spinosa</i> L.	Kabbar – Shafla
5	Asteraceae	<i>Artemisia herba- alba</i> Asso. <i>Matricaria chamomilla</i> . <i>Helichrysum stoechas</i> L.	Sheeh Baboonej Aushbat al'arnab\ karishat al'arnab
6	Lamiaceae	<i>Mentha piperita</i> L. <i>Rosmarinus officinalis</i> L. <i>Thymus capitatus</i> L. <i>Salvia officinalis</i> L. <i>Origanum majorana</i> L.	Nanah Eklil aljabal Zaatar Tefah El-Shahi Mrdagosh
7	Rhamnaceae	<i>Ziziphus lotus</i> L.	Sidr –Nabq
8	Anacardiaceae	<i>Pistacia lentiscus</i> L.	Butom
9	Urticaceae	<i>Urtica pilulifera</i> L.	Horreiq
01	Fabaceae	<i>Capparis spinosa</i> L.	Al-carob
00	Myrtaceae	<i>Myrtus communis</i> L.	Mersin
01	Ruppiaceae	<i>Marrubium vulgare</i> L.	Rubya
02	Umbelliferae \ Apiaceae	<i>Pimpinella anisum</i> L.	Alyanson \ Camun
03	Ericaceae	<i>Arbutus pavarii</i> Pamp.	Shmeri

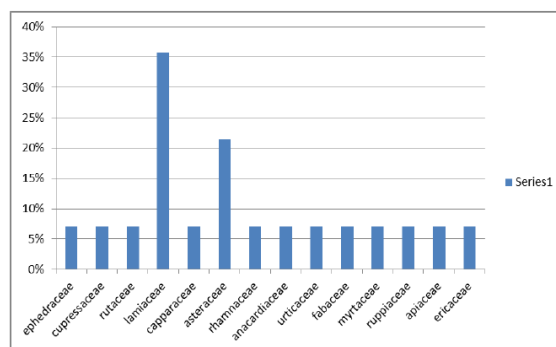


Figure 23: Distribution of the usage frequency of the most used plant species.

#### 4.3 The plant species selected in recipes and therapeutic treatments

The types of counted recipes of medicinal plants, their mode of preparation, the administered quantity, treatment duration, and the other medicines in which they are used, all are presented in Table 4. It shows that 6 types of medicinal recipes were inventoried. These preparations were obtained either from a mixture of two medicinal plants (recipe 6 with 10%), or from a mixture of three (recipe 4 with 15%), mixture of four (recipe 5 with 20%) and five (recipe 2 and 3, with 25%).

As the types of counted recipes of medicinal plants has been recorded, their mode of preparation, the administered quantity and therapeutic treatment has been

obtained.

These recipes were prepared from plants, by decoction which constitutes the most frequent mode of preparation (55%), or by infusion (45%) in water (66%), or even taken by inhalation (16%), and a recipe used topically (16%).

It shows that these recipes are generally administered orally during seven, fifteen or even thirty days with an average of one to three cups a day. These recipes are assigned to heal a lot of illnesses that could be chronic or temporary. Some of these recipes are used to treat several other illnesses, particularly those of the digestive and respiratory system.

Table 4: List of combination plant species used in different recipes, modes of preparation and posology.

Recipe N°	Plant names	Local name	Mode of preparation & administration time	Diseases treated and uses
1	<i>Matricaria chamomilla</i> . <i>Pimpinella anisum</i> L.(20g) <i>Rosmarinus officinalis</i> L. (30g) <i>Trigonella foenum-graecum</i> L. (10g) <i>Zingiber officinale</i> (10g) Yeast is (1tsp) Black honey (1\2K)	Baboonej Camun\ yansun Eklil aljabal Helba Eklil aljabal Zingiber	By (mix the quantities together well and take one spoonful of the recipe 1h before lunch every day)	Tonic and weight gain
2	<i>Glycyrrhiza glabra</i> (20g) <i>Camellia sinensis</i> (1g) <i>Rosmarinus officinalis</i> L. (10g) <i>Punica granatum</i> (2tsp)	Eiraq alsuws Green tea Eklil aljabal Pomegranate peel	By (mix the quantities well and take a spoonful in the morning and evening)	Inhibited OR treat H. pylori (stomach bacteria )
3	<i>cinnamomum verum</i> (1tsp) <i>Zingiber officinale</i> (1tsp) <i>Citrullus colocynthis</i> (L.) (1tsp) <i>Salvia officinalis</i> L. ) (1ts) <i>Aloe Vera</i> (1tsp)	Qurfa Hanzal\ Bitter-apple Zingiber Tefah Shahi	By (mix these quantities together and take one amount out of them, boil a spoonful in a cup of water and filter, cup daily in the morning)	Reduce HbA1C
4	<i>Rosmarinus officinalis</i> L. (30g) <i>Matricaria chamomilla</i> . (20g) Beeswax (1/2tsp)	Eklil aljabal Baboonej Qir	By (mix quantities well then take amount and put it on the fire then inhalation the rising smoke once daily)	Sinusitis
5	<i>Pimpinella anisum</i> L. (20g) <i>Matricaria aurea</i> Sch. Bip (30g) <i>Foeniculum vulgare</i> Mill (40g) <i>Avena sativa</i> (30g)	Camun\ yansun Baboonej Camun earid shoofan	By (mix ingredient well and take a spoonful and boil in cup of water on an empty stomach daily)	Weight loss
6	<i>Juniperus phoenicea</i> L. <i>seriphidium herba- alba</i> Alum and olive oil	AL-arar Sheeh	By ( Mix the ingredients together and then apply them to the skin)	Dermatitis especially Eczema

#### 4.4 Plant species used without Additives and Posology

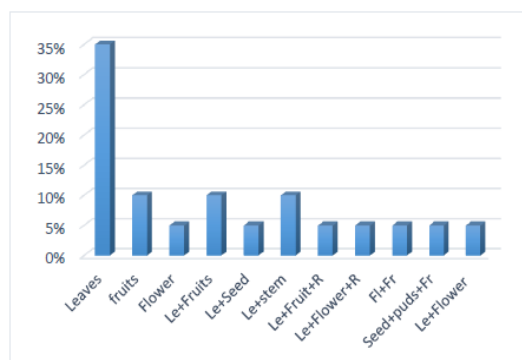
Table 5 and Figures (24), demonstrated the list of plant species that are used alone without additives or mixing with others, which used in various therapeutic applications. In the same time, organs of the plants used, solvent used, their usage aspects and their mode of preparation. were shown in Figures (24) a, b, c and d respectively. According to traditional healers, these recipes were made from the most available plants in their areas. This allows traditional healers to have many options when it comes to the plants that they can use in their recipes. Traditional healers think they get better results when they combine plants. However, several studies have shown that there might be unwanted interactions between the components of the many species of plants that are used in preparing a remedy for diseases (Bussmann and Sharon, 2006; Ouhaddou *et al.*, 2014). The previous data shows that the most used parts of the plants in recipes are leaves with 40%. According

to Zheng and Xing (2009); El Yahyaoui *et al.* (2015); Salhi *et al.* (2019), leaves were the most frequently used part of plants (47.3%). Also, this organ is the most used part in treating several diseases and dermatological wounds (Adetutu *et al.*, 2011; Bhat *et al.*, 2013; Ouhaddou *et al.*, 2015 and Salhi *et al.*, 2019). In addition, Bigendako- Polygenis and Lejoly (1990) found many chemical components that are synthesized by plants, in the form of secondary metabolites biologically active in this organ. The harvest ease justifies the high rate of leaves, however, a huge part of it can be granted to the sun which when exposed to the organs get their virtues and benefications (El Rhaffari and Zaid, 2000). An explanation of such case would be by photosynthesis phenomenon which prefers the biosynthesis and the storage of metabolites (Simbo, 2010; Ouhaddou *et al.*, 2014). Moreover, and in a descending order, the other plant parts that are used are fruits (25%), flower and leaf (15%), flower (1%), stem and leaf (1%), leaf, flower and root (1%), leaf, bud (1%) and flower, seed and leaf (1%).

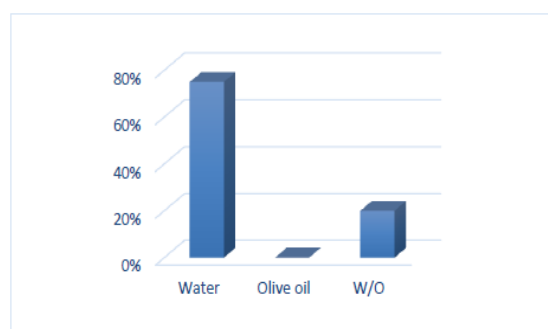
**Table 4: List of plant species used alone in various therapeutic applications, modes of preparation, part of the plant and the solvent used and posology.**

Scientific name	Local name	Habit	Part used	Preparation Mode	Solvent	Route of administration	Treatment period	Therapeutic uses
<i>Ephedera altissima Desf.</i>	Alandi margad lefa'a	shrub	leaves	Decoction of crushed dried leaves For 10 min	W	Oral "on empty stomach"	04-12D	Blood Infection and Anticancer
<i>Juniperus phoenicea L.</i>	Al-arar	Tree	leaves fruits	Decoction	W	Oral	12D	Gastritis Ulcers Colitis UTI
<i>Ruta graveolens</i>	Alfaijal	Shrub	leaves seeds	Decoction of 2tsp of dried plant	W \ O	Oral Topical	3D –O 12D –T	-Flatulence in children -rheumatism "joint pain" -Spasm -bladder Stones
<i>Mentha piperita L.</i>	Nanaa	Herb	leaves stem	Infusion	W	Oral	04D	Spasm Flatulence Intestinal gas
<i>Rosmarinus officinalis L.</i>	Eklil aljabal	Shrub	leaves	Infusion	W	Oral Topical	21D	-Ovarian cysts -HTN -Period cramps -Dandruff
<i>Capparis spinosa L.</i>	Kabbar/ Shafalah	Shrub	Seeds Fruits buds	Decoction For 15min	W\O	Oral Topical	12D	Rheumatic Anticancer Gastritis Bone pain
<i>Seriphidium herba-alba</i>	Sheeh	Shrub	leaves	Infusion 2tsp for 21min	W\O	Oral Topical	3D	-Mouth wash -Intestinal worms 20 -Intestinal antiseptic-Wound Healing
<i>Thymus capitatus L.</i>	Zaatar	Shrub	leaves	Infusion 2tsp for 15Min	W	Oral	2-1D	Cough (chest infections and expectorant)
<i>Salvia officinalis L.</i>	Tefah Shahi	Shrub	leaves	Infusion	W	Oral	04D	Regulation Of hormones and ovary Function anti-diabetic

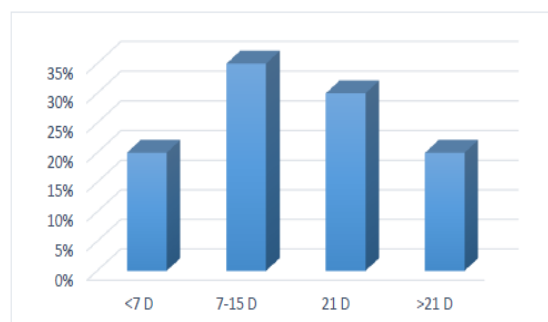
								Decrease (glucose level)
<i>Origanum majorana L.</i>	Mrdago-sh	Shrub	leaves	infusion 2tsp	W	Oral	24D	HTN Hormones Regulation Migraine
<i>Ziziphus lotus (L.) Lam.</i>	Sidr\Nabq	Tree	Leaves Fruits Root	A decoction 1spoon in water for 1h	W	Orally (In the morning on an empty stomach)	7D	Gastritis Blood Clotting Insomnia root use for skin sensitivity
<i>Pistacia lentiscus L.</i>	Butom	Tree	Leaves Fruits	A decoction 1spoon in water for 1h or extract the oil from fruits and Chewing like gum	W\O	Orally Topical	7D	Gastritis Gingivitis Stop and Sterilize the wound site Anemia
<i>Matricaria chamomilla</i>	Baboonej	Flowers	Flowers	Infusion is 1–2 tsp in one cup of water or tea can be taken daily	W	Orally	12D	Antispasmodic Involuntary urination Stomachache Sinuses
<i>Urtica pilulifera L.</i>	Horrei	Shrub	Leaves and stem	A decoction	W\O	Orally Topical	7-8D	Kidney stone Sciatica Arthritis Prostate enlargement
<i>Ceratoniasiliqua L.</i>	Al-carob	Tree	Fruits	Infusion decoction or	W	Orally	12D	Promotes digestive health Diarrhea, colon Anemia Influenza
<i>Helichrysum stoechas L.</i>	Aushbat al-iarnab\ Karishat alarnab	Shrub	Root Leaves Flowers	Infusion is made from 1–2 tsp In one cup of water or tea can be taken daily twice	W	Orally	D3	Kidney stones UTI carminative Muscular tearing
<i>Myrtus communis L.</i>	Almarsin \Alas	Tree	Leaves Flowers	decoction or crushing	W	Orally Topical	D12D	Diabetic (Regulating blood sugar) Stomachache Hair musk
<i>Marrubium vulgare L.</i>	Rwbya	Shrub	Leaves	Crushing then decoction 1spoon in water for 30min	W	Orally	12D	Diabetic (Regulating blood sugar) Cervical cancer Gangrene wounds fibrous cysts
<i>Pimpinella anisum L.</i>	Camun\ yansun	Flowers	Fruits (Seed)	decoction is 1-2 spoon in water for 5min	W	Orally	4D	Tranquilizer, spasmolytic, cough, Lactagogue and analgesic in migraine
<i>Arbutus pavarii Pamp</i>	Shmari	Tree	Fruits Flowers	Flowers graze on bees and produce honey	—	Orally	4D	Constipation (Laxative) Urinary tract infection, Cough



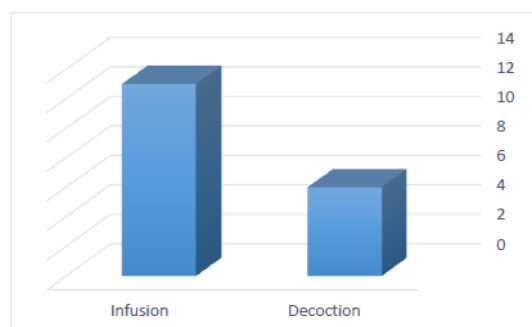
**Figure 24 a: Part of plant used.**



**Figure 24 b: Solvent used.**



**Figure 24 c: Treatment period.**



**Figure 24 d: Mode of preparation.**

The Trotter Collection can represent a useful tool for current ethno pharmacological research in Libya and neighboring countries. It is known that about 80% of the African population presently rely on traditional forms of health care, but it is not easy to document continuity and changes in therapeutic approaches. The information

collected by Trotter contributes to filling this gap, enabling us to trace the use of plant utilization in Libyan folk medicine over the last century. A comparison with the recent ethno pharmacological research in Maghreb reveals a high correspondence; almost all of the plants cited by Trotter are still used in the folk medicine of at

least one of the North African countries, and therapeutic uses of each plant appear consistent over that time.

The results of this study, although based on information that needs to be confirmed by current methodologies, seem to suggest that it is possible to find a core of a shared popular medicine along the African Coast of the Mediterranean Sea, probably due to climatic, cultural and linguistic continuity.

#### 4.5 Marketing of plant species overview

Generally in our studying area, the price of the recipes varies according to the ingredients. Some herbs are expensive to purchase and that is due to the effort, collection methods, and scarcity of the plant. This requires the traditional healer or herbal expert to increase the price of the recipe.

It also takes into account several things that increase the price of the recipe, namely the packaging, sticker, printing information, and methods of use, taking into account experience. These are also taken into consideration, and this matter may increase the price of the mixture for the consumer and plants whose prices are high, such as saffron, ginseng, pollen, and rhubarb, for example.

Our traditional healers whose participate in our study, were refused to give us the exact prices of the recipes mixtures or the plants they sale.

#### 5. CONCLUSIONS

The main problems affecting the practice of traditional medicine include the lack of information on practitioners including their qualification, registration, educational background, location, number and the products used in their practices.

The information collected by Trotter is an important contribution to tracing plant utilization in Libyan folk medicine over the last century. For that, we advise to register the voucher specimens which supports research work, for all samples of Aljabal Alakhdar medicinal plants at a higher scientific institute in our country which is not available yet.

Some herbal remedies might be helpful to relieve mild symptoms. However, a lot of the products that are sold in the market are not properly inspected for safety or efficacy, so if you are going to use some products, make sure to use ones that are produced by well-known and respected companies. We would advise against picking plants and concocting your own remedies, that is dangerous, unless you know what you are doing.

It's difficult to understand how some herbal medicines react with medicines that have been prescribed by a primary care provider.

This study shows that traditional medicine is still used

and constituted a very rich heritage in east Libya in Aljabal Alakhdar area. Further investigation of the benefits and risks of these plants will be needed to guide ancestral knowledge during self-medication that causes negative effects on human health and will be needs planned exploitation.

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