

Contribution to the floristic and ethnobotanic study of the most utilized medicinal plants in the Sétifian Tell (south of the Tamentout forest) east Algeria

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Abstract. This study aims to know the natural heritage of the Tamentout forest through a floristic inventory made in several cantons and to evaluate the uses of traditional medicine in the Sétifian Tell, by conducting an ethnobotanical study at the level of several localities in the region. A quantitative and qualitative analysis of the listed flora identified 101 plant species, which are divided into 38 families and 97 genera. An important representation of the Asteraceae (19%), Fabaceae and Lamiaceae families (11%) are noted. The floristic study emphasizes the presence of several biological types, with a codominance of hemicryptophytes (with 42%) and therophytes (31%). The Mediterranean floristic element constitutes the most important chorological ensemble (52%). The ethnobotanical survey was conducted among 82 informants, with a total of 290 questionnaire cards. All the results were processed by statistical processing software: Excel 2007 and IBM SPSS Statistics version 23. These results showed that the leaves are the most used part (43%) and that the methods of use are prepared in the form of infusion (25%), poultices (18%), and decoction (11%). The most common forms of use are herbal tea (46%), powder (25%), and essential oil (19%). The oral route is the most widely used route of administration (51%). The most common pathologies are those of the digestive system (20%) and the respiratory system (18%). This study made it possible to identify the diversity of the flora of the Tamentout South Slope forest and list its traditional care and consequently to contribute to the conservation of the Mediterranean pharmacopeia that is being lost.

Keywords: Floristic Inventory; Tamentout forest; Ethnobotany; Traditional medicine; Rural and urban population.

Contribución al estudio florístico y etnobotánico de las plantas medicinales más utilizadas en Sétifian Tell (sur del bosque de Tamentout), este de Argelia

Resumen. El objetivo de este estudio es conocer el patrimonio natural del bosque de Tamentout a través de un inventario florístico realizado en varios cantones y evaluar los usos de la medicina tradicional en Sétifien tell, mediante la realización de un estudio etnobotánico a nivel de varias localidades de la región. Un análisis cuantitativo y cualitativo de la flora mencionada identificó 101 especies de plantas, que se dividen en 38 familias y 97 géneros. Se observa una importante representación de las familias Asteraceae (19%), Fabaceae y Lamiaceae (11%). El estudio florístico enfatiza la presencia de varios tipos biológicos, con un predominio de hemicryptophytes (42%) y terófitos (31%). El elemento florístico mediterráneo constituye el conjunto corológico más importante (52%). La encuesta etnobotánica se realizó entre 82 informantes, con un total de 290 tarjetas de cuestionario. Todos los resultados se procesaron mediante un software de procesamiento estadístico: Excel 2007 e IBM SPSS Statistics versión 23. Este resultado mostró que las hojas son la parte más utilizada (43%) y que los métodos de uso se preparan en forma de infusión (25%), cataplasmas (18%) y decocción (11%). Las formas más comunes de uso son el té de hierbas (46%), el polvo (25%) y el aceite esencial (19%). La vía oral es la vía de administración más utilizada (51%). Las patologías más comunes son las del aparato digestivo (20%) y el sistema respiratorio (18%). Este estudio permitió identificar taxonómicamente la diversidad de la flora del bosque de Tamentout South Slope y enumerar sus cuidados tradicionales y, por consiguiente, contribuir a la conservación de la farmacopea mediterránea que se está perdiendo.

Palabras clave: Inventario florístico; bosque de Tamentout; etnobotánica; medicina tradicional; población rural y urbana.

Introduction

In recent years, the increasing use of plants in traditional medicine has stimulated an interest in ethnobotanical studies around the world (Trabi *et al.*, 2008; Ghourri *et al.*, 2013; Orch *et al.*, 2015). According to the World Health Organization (OMS), more than 70% of populations in many countries use traditional medicine to treat various diseases (Jiofack *et al.*, 2010). In response to the spread of several diseases, World Health Organization urges developing countries to integrate, in their official health system, herbal remedies whose aspects, safety, efficacy, and quality are guaranteed (Bouzabata, 2017).

Algeria has encouraged in recent years the preservation of the centuries-old knowledge accumulated by traditional medicine (Maiza *et al.*, 2005; Chermat *et al.*, 2015; Fassaci, 2017). However, the lack of a defined regulatory framework in the marketing of medicinal plants and their threatened habitats is an obstacle to their management and their economic and social recognition (Sahi and Libert, 2016). Besides, the majority of ethnobotanical work has focused on users and neglecting the real floristic aspect of the field (Hammiche and Gueryouche, 1988; Hamel *et al.*, 2018). It is essential to inventory the spontaneous medicinal plants which constitute the source of fundamental knowledge of pharmacology

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and the best way for the conservation of biological resources for a rational use in a context of sustainability (Silambarasan *et al.*, 2017).

In North Africa, floristic and ethnobotanical studies have identified several taxa, most of them used in traditional care according to the IUCN program (Chemili, 2005). In Algeria, out of 3150 listed taxa, more than 500 medicinal plants are used (Bitam, 2012), which is in the second position after Morocco, with 3800 taxa (Medail & Quézel, 1997). More recent statistics give 4305 taxa for Algeria and 5191 for Morocco (Dobignard & Chatelain 2010-2013).

This study aims to get a more accurate idea of the real situation of traditional medicine in the eastern region of Algeria, more precisely in the region of Setifian Tell. A floristic study was conducted in the Tamentout forest (part of the district of Setif), and an ethnobotanical study at some localities of Setifian Tell and the neighboring localities near the forest. Tamentout forest is an important reservoir and a favorable site for the harvest of medicinal plants by the populations (Sari, 1999; Zakaria, 2018). Due to their ceaseless demand from Herbalists, whose number reached 445 in the Setif region, medicinal plants, from this forest, are regularly harvested and marketed (Sahi & Ilbert, 2014). Thus, the frequent use of medicinal plants and the increased numbers of herbalists and traditional healers in the region attracted our attention. This, contact us to make an update about traditional practices and key species uses. This investigation aims to carry out a regional inventory of medicinal and aromatic plant species, in order to apprehend the endangered ones, because of overexploitation for commercial uses, overgrazing, and lack of management and to sought preservation ways to avoid their irreversible erosion (Hseini *et al.*, 2007).

Materials and Methods

Study area

The forest of Tamentout is one of the most important forests of the Tellian Atlas. It is in small Kabylie and covers the whole massif of Tamezguida (Souaci, 2016). It is bordered on the north by the forest massif of Guerouche and on the west by Agoug mountain, on the east by M'karkcha and Bouafoune mountains. It is spread over three cities, Setif to the southeast (80 km), Jijel to the north (30 km) and Mila to the east (70 km), and covers a large area of 9607 ha according to the program of Forest Management and Development Alfatier in Algeria (2006). It will be noted that the forest is formed by two slopes, the southern, and the northern slope. The southern slope and part of the northern slopes are on the territory of the district of Setif, and most of the remaining northern slope is on that of the district of Jijel.

The geographic coordinates of the forest are between 36°29' and 36°31' North and between 5°43' and 5°49' East. Altitude: 871 m asl (Figure 1). From a phytogeographic point of view, it is located in the

Kabylo-Numidien sector, more specifically in the "Kabylie of Babors" sub-sector (or small Kabylie), the South-East part is in the Constantinois Tell sector (Quézel & Santa, 1962).

The area of the forest of Tamentout in the territory of Setif is 3176.74 ha and spread over seven cantons (Zerroug, 2012). The bioclimatic stage that characterizes this part is semi-arid to cool in the winter, with an average annual rainfall of 600 to 800 mm concentrated in winter and spring (Zerroug, 2012). The topography as a whole is very rugged (slopes between 10 and 40%). The southern zone is characterized by summits deprived of vegetation. The Numidian sandstones are the essential geological formations of this forest. The forest soils are forest brown, stony, deep, and dry. These are medium soils rich in humus, and non-acidic fine elements maintain good aeration (Benmecheri, 1994).

The forest is distinguished by the presence of several formations of oak forests (cork oak forest, Zeen Oak, African oak, and some feet of green oak) that are presented in pure or mixed stands. The presence of undergrowth, dense shrub, and herbaceous vegetation constitutes a remarkable floristic richness. The production of cork is widely developed and is an economical source of income in the region.

Floristic inventory

The work consisted first to list all the species of the floristic procession of the forest of Tamentout, then to determine them. Plant identification was carried out at the laboratory for "Laboratory of Phytotherapy Applied to Chronic Diseases" at the University of Setif. To do this, we used the "new flora of Algeria and southern desert regions" (Quézel & Santa, 1962-1963) and the "flora of North Africa" (Maire, 1952-1987). The new nomenclature has been updated for inventoried species taking into account recent work compiled in the bibliographic index of the flora of North Africa (Dobignard & Chatelain, 2010-2013). The fresh plants harvested are dried and put in the herbarium, with all the necessary information. Bibliographic data relating to families, biological types, and chorology of listed species are retained concerning the flora of Quézel and Santa (1962-1963).

The inventory was made on the southern slope of the forest of Tamentout (part of the district of Setif) more exactly in the cork oak forest. Five stations corresponding to the lawns and matorrals (degraded formations of the forest) of the canton (Forest administrative subdivision) of the forest have been inventoried (Figure 1). The choice of stations was based on the proximity of the dwellings, their accessibility as well as their remarkable biodiversity (density).

Sampling was done using a stratified random sampling method (Gounot, 1969). Given the heterogeneity of the forest, we have defined five strata in the study area considered. The strata thus formed are homogeneous formations whose stratification criteria are related to the type of formation corresponding to matorrals and lawns resulting from the degradation of the forest as well as

to an altitudinal gradient. Species were then randomly sampled in each stratum so that each member of the population had an equal chance of being included in the

sample without discount (an already selected individual could not be again) with a number proportional to the area of each stratum (Figure 1).

Table 1. Characteristics of harvesting stations in the Tamentout forest (on the territory of the Sétif district).

	Station 1	Station 2	Station 3	Station 4	Station 5
Canton	Sidi Othman	Sidi Othman	Timdjiri	Timdjiri	Boudjerdane-sidi Othman
Exposition	West-North	West-North	South	South-west	East
Altitude (m asl)	900 m	920 m	832 m	900 m	1018 m
Layer	Herbaceous	Shrubby	Shrubby	Herbaceous	Shrubby
Formation	Lawn	Matorral	Matorral	Lawn	Matorral

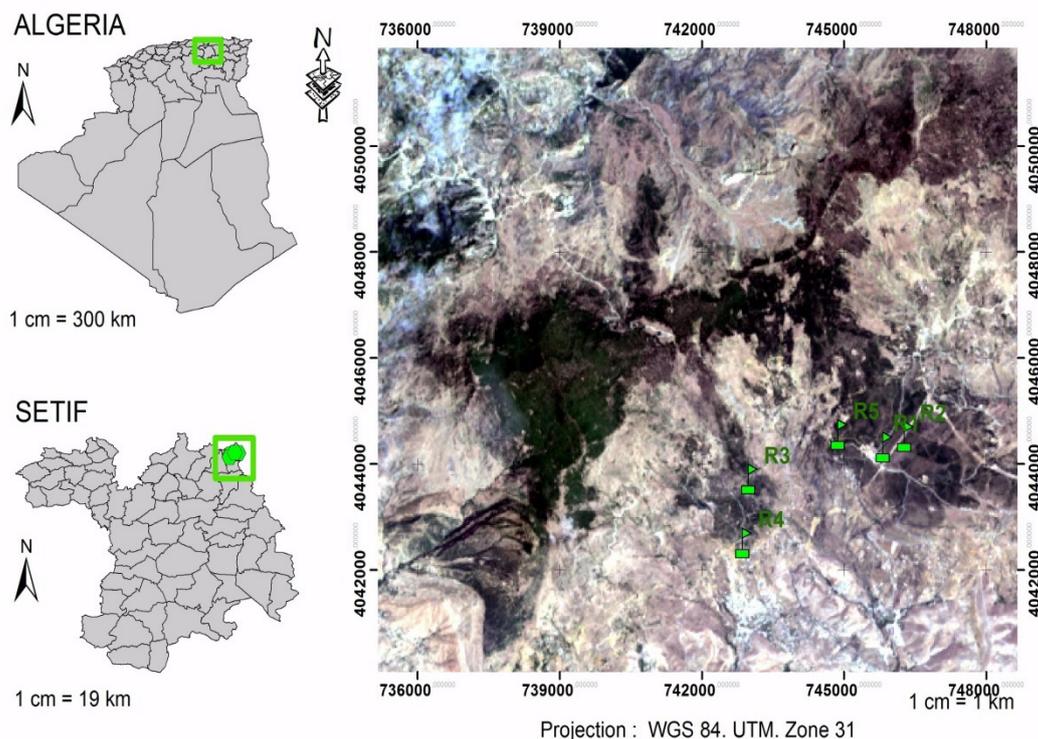


Figure 1. Location of the Beni-Aziz municipality in Algeria. Map of the Tamentout Forest and the sampling stations (satellite Image).

Ethnobotanical survey

The study consisted of a series of ethnobotanical surveys to identify the most used plants in traditional medicine at Tell Setifian and to collect as much information as possible about how to use and exploit these plants in traditional herbal medicine. To achieve this goal, we have followed two steps. A first survey allowed thanks to an unorganized (random) meeting with the various informants and a review of the available literature on the most used plants in the Tell Setifian using the floristic list collected in the Tamentout forest. At the end of this survey, a set of 29 plants were selected (Table 3). A second survey based on a questionnaire form was conducted among different categories of informants while favoring traditional healers and herbalists who have more information on these plants according to their availability.

The survey was conducted among 82 informants in seven localities in the region of Tell Sétifian and three

municipalities bordering the forest (Beni-Aziz, Ain-Sebt, and Serdj-El-Ghoul, Table 2, Figure 1) from 2016 to 2018. The total number of completed files is 290. In the questionnaire, several aspects were considered, such as the taxonomic information collected from each plant, which relates to local vernacular identity and the floristic aspect (Appendix 1). The socio-demographic characteristics of the respondents, the profile of each informant (age, sex, level of education, family situation, and occupation). Finally, the therapeutic indications relating to the ethnobotanical and ethnopharmacological aspect were apprehended through the type of medicine, the use of the plant, the parts used, the form of use, the method of preparation, the dose used, the mode of administration, the duration of the treatment, the diagnosis (origin of the information in the use of the plants), the result (perception of the results of the care of the plants used), and the toxicity. The collected data were entered into a database and processed then analyzed statistically using Microsoft Office Excel 2007 and IBM SPSS Statistics version 23.

Table 2. Distribution of respondents by location (surveys conducted in October 2016 to May 2018).

Locality type	Locality Name	N. respondents
Town	Sétif	48
District	Ain-Oulmène	5
District	Ain-Kebira	5
District	Maoklane	2
District	Ain-Arnet	1
District	Ain-Azel	5
Municipality	Ouricia	1
Municipality	Beni-Aziz	9
Municipality	Ain-Sebt	2
Municipality	Serdj-El-Ghoul	4

Results

Floristic analysis

The inventory made it possible to draw up a floristic list of 101 species distributed over 38 families and 97 genera (Appendix 1). The richest family is the Asteraceae with a proportion of 19%, followed by Fabaceae and Lamiaceae, with 11% finally Poaceae with 9%. Other families, including Apiaceae, Caryophyllaceae, Cistaceae, Cupressaceae, Fagaceae, Liliaceae, and Rosaceae, represent 3%. The rest of the families represent only 1% of the total.

The species recorded in the study area are distinguished within 6 different biological types. Biological types in the sense of (Raunkiaer, 1934) have been identified in the field by the respective observation of vegetative parts (Woukou-Taffo *et al.*, 2018). The hemicyptophyte and therophyte are the most dominant biological types. They represent respectively 42% and 31% of the flora of the studied area. Other biological types indicate less than 10%.

Biogeographic and ecological conditions of the forest that overlap between the Tell, the littoral and the steppic influence are favorable to the presence of both Mediterranean flora (52%), wide-ranging flora (28%) (Eurasian, Euro-Mediterranean, cosmopolitan and subcosmopolitan species) and some northern species (20%) concerning the classification of phytogeographic types of (Quézel and Santa, 1962). There are also few endemic species in the area: the North African *Genista tricuspida* and *Galium tunetanum* and *Origanum vulgare* subsp. *glandulosum* which is Algerian-Tunisian exclusively; *Quercus afares* is a Numidian endemic species. If we look at the vulnerability and rarity of the elements of the considered flora, we note it is mostly a flora common to the Tell. The presence of some species, however, stands out by their rarity (15 species) in certain areas according to Quézel & Santa (1962), are *Anthemis arvensis*, *Ampledoesma mauritanica* and *Melilotus indicus*.

Ethnobotanical and ethnopharmacological analysis

Age classes and level of education

The treatment of the data for the profile of the respondents reveals that, at the scale of the ten visited localities, there

are four age groups: persons in both the 20-39 years age group and this of 40-59 years have a rate of (44%) each one. Beyond the age of 60 years, a relatively small percentage is noted at less than 10% for the other two classes (Table 3).

According to the level of education, which is interested in medicinal plants, most of the respondents are between the secondary and the university level. The majority of people who are interested and use medicinal plants are therefore educated. The rest know but seem to have lost interest in medicinal plants (Table 4).

Gender, family situation, and profession

Both genders are concerned with traditional medicine, however, women showed a slightly higher rate (51%) compared to men (49%) (Table 4). Married people mark a higher rate, with 59% against 41% of singles (Table 4). The practice of traditional medicine is more pronounced among married people than among single people.

The profession of respondents is diversified, and we note that users highlight the highest rate with 46%, followed by an herbalist who indicates a rate of 42%, healers are confused with herbalists because some herbalists consider themselves healers with a rate of 4%. These 4% represent woman healers who generally practice traditional medicine at home (Table 4).

Type of medicine and use of plants

The considered plants are particularly used in traditional medicine; 78% of the informants highlighted this assumption. Moreover, 22% of the respondents indicate that these plants can be used in modern medicine. This concerns the most knowledgeable people on herbal medicine (Table 4).

Regarding the use of plants, it should be noted that medicinal plants are often multiple uses: It was noted that most are certainly more therapeutic with 69% than cosmetics with a rate of 19%, some species are culinary (food) being estimated at 12% (Table 4).

Parts used and method of preparation

Leaves are the most used part for all respondents with a percentage of 43% followed by flowers with 13%, the stem is also used with a rate of 10%. The observed rate for other organs is less than 10%. It should be noted that the uses of plant organs are sometimes combined (Figure 2, Table 3).

Several methods of preparation are used such as decoction, infusion, fumigation and poultice. Infusion and the poultices are the most widespread, especially in cooked mode with (25%), followed by the poultices in raw mode which scored a rate of 18%, the decoctions are used with a rate of 11% (Table 4). Most recipes are prepared mainly as infusion and poultice.

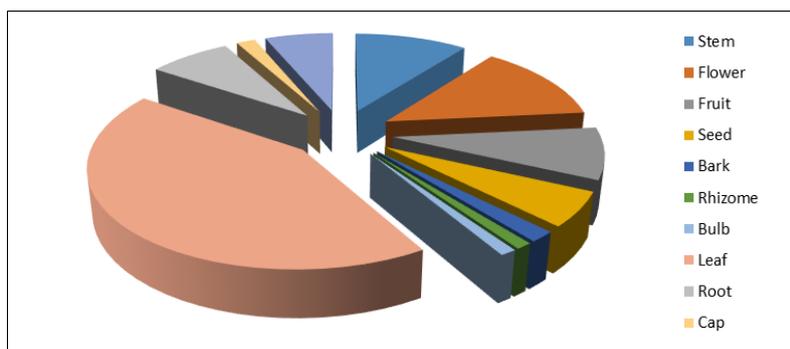


Figure 2. Distribution of the different parts used on the studied medicinal plants.

Form of use, administration mode, dose used and duration of treatment

The most common form of use is herbal tea with a rate of 46%, the powder is also used with a rate of 25%. The essential oil is quite used in certain plants such as *Pistacia lentiscus* that scored a rate of 19% (Table 4).

The oral route is the most common mode of administration with a rate of 51% followed by the massage with a rate of 27%, the skin exposure and rinsing mark a rate of 12 and 10%, respectively (Table 4). The recipes are administered orally or/and by massage. Very often the majority of species use the spoonful with (58%) to prepare the infusion and the decoction or handful with a rate of (42%). The recommended duration of treatment is to go until healing; however, the reported duration for toxic and irritating species is one day (Table 4).

Use of plants according to the treated diseases

The preparations (recipe) identified were grouped into 9 categories of diseases (Table 5), the majority of medicinal plants are used mainly to treat diseases of the digestive system and the respiratory system with respectively 20% and 18%, followed by dermatological diseases (12%), osteoarticular diseases (11%), cardiovascular and metabolic diseases (10%). Other diseases (genitourinary, neurological, and gland diseases) score less than 10% (Figure 3).

All the listed species treat a very diverse and important range of pathologies in which diseases of the digestive system and respiratory system highlight the highest rate (Figure 3). Several plants treat the diseases of the digestive tract; the most popular species in this region belong mainly to the family of Lamiaceae, Linaceae, Fagaceae, and Anacardiaceae (Table 5).

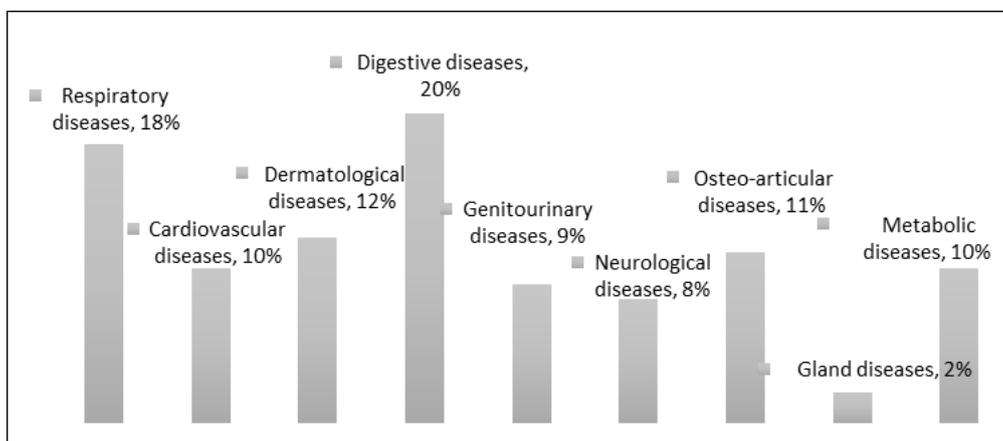


Figure 3. Distribution of types of diseases treated by medicinal plants Results, diagnosis of plant care and toxicity.

In order to better understand the use of our plants, we wanted to evaluate among our respondents their diagnosis and their perception of the results of the used plants. It was noted that the majority of respondents self-diagnose their illness (54%), 42% resort to herbalists and only 4% seek the advice of the doctors. Most respondents are satisfied with the results because 61% believe that medicinal plants can cure treated diseases and 39% of them think that the plants used contribute to an improvement of their health status (Table 4).

The toxicity and irritation of certain used medicinal plants was noted in particular for *Nerium oleander*, *Thapsia garganica*, *Daphne gnidium*, *Carlina gummifera*, which are cited for their toxicity. Therefore, other species such as *Globularia alypum*, *Capparis spinosa* subsp. *spinosa*, *Ajuga iva*, *Calicotome spinosa* and *Dittrichia viscosa* are considered irritating to the surveyed population. This toxicity affects 19% of all plants. Their use must be done with care and are recommended most often for external use (Table 4).

Table 3. List of the most used plants in the study area: local names, their parts used, the associated pathologies, method of use, and citation. Abbreviations are: Part used: L, Leaves; S, Stem; FR, Fruit; FL, Flower; W.P, Whole plant; R, Root; CP, Caps; RH, Rhizome.

Family	Scientific name	Local name	Part used / treatment	Method of use	Citation
Fabaceae	<i>Calicotome spinosa</i>	Guendoul	R,S /Treatment of eye infections and warts	External use	9
Asteraceae	<i>Centaurea calcitrapa</i>	Bounagar	W.P, L /Antidiabetic, Rheumatism and Stomach pains	Oral / whitewashing	9
Lamiaceae	<i>Mentha pulegium</i>	Fliou	L, S /Respiratory and digestive disorders	Oral / Rinsing	8
Linaceae	<i>Linum usitatissimum</i>	Kettane	Seed /Osteo-articular disorders and slimming	Oral	14
Ericaceae	<i>Erica arborea</i>	Akhelendj	FL, L /Uro-genital disorders	Oral	10
Lamiaceae	<i>Lavandula stoechas</i>	Halhal	L, FL /Cough, digestive pain and soothes inflammation of the skin	Oral / Massage	13
Lamiaceae	<i>Origanum glandulosum</i>	Zâater	L, S, Fr /Flu, stomach pain Eczema, Headache	Oral / Massage / whitewashing	15
Liliaceae	<i>Asphodelus ramosus</i>	Bourouag	Rhizome /Respiratory disorders, Psoriasis, Tension disorders	Oral /whitewashing	3
Thymeleaceae	<i>Daphne gnidium</i>	Lazzaz	L/Rheumatic and muscular pains	External use	12
Fagaceae	<i>Quercus ilex</i>	Bellout	L, CP/Digestive disorders (Ulcers), Enuresis, prostate problem, dental gingivitis	Oral	14
Asteraceae	<i>Carlina gummifera</i>	Laddad	RH/Respiratory and genitourinary disorders, Rheumatism	External use	6
Rosaceae	<i>Crateagus monogyna</i>	Bou mekherri	Fr, L/Cardio-vascular disorders (regulates tension and lowers cholesterol)	Oral	10
Lamiaceae	<i>Mentha spicata</i>	Nana	L, S/Asthma, Digestive Disorders, Sedative, Headache	Oral use of massage oil	9
Apocynaceae	<i>Nerium oleander</i>	Defla	L, S/Respiratory disorders, Wounds and Infections, Antidiabetic, Genital infections (Hemorrhoids)	External use	12
Capparaceae	<i>Capparis spinosa</i>	Kabar	R, L, FR/Respiratory disorders, Muscular and rheumatic pains	Oral /whitewashing	10
Asteraceae	<i>Dittrichia viscosa</i>	Amagramane	L,R /Sprains, Antidiabetic, Respiratory Disorders	Oral/Massage	13
Cupressaceae	<i>Cupressus sempervirens</i>	Ceroual	L, FR /Cold, Flu, Hemorrhoids varicose veins, Colon	Oral/massage	6
Globulariaceae	<i>Globularia alypum</i>	Taselgha	L,FL, R/ Stomach disorders, Gynecological disorders (infertility), fortifying	Oral / whitewashing	11
Lamiaceae	<i>Ajuga iva</i>	Chendgoura	W.P/Digestive disorders (colon), Respiratory disorders	Oral/Massage	11
Lamiaceae	<i>Rosmarinus officinalis</i>	IKlil el djabel	L, W.P /Digestive and respiratory disorders acts on rheumatic and anti-stress pain	Oral	14
Lamiaceae	<i>Teucrium polium</i>	Khyata	L /Digestive and A dermatological disorders, lowers the sugar level	Oral/Massage	13
Liliaceae	<i>Drimis maritima</i>	Anecla	L, W.P/ Anti-influenza, rheumatic pain, sterility problem	Oral/Massage	5
Rhamnaceae	<i>Ziziphus lotus</i>	Sedra	L /Respiratory disorders (tuberculosis), lowers cholesterol, sexual impotence, stimulates appetite, used in magic and religious belief (Rokia)	Oral / Massage / Rinsing	12
Apiaceae	<i>Thapsia garganica</i>	Driasse	R / Rheumatic and muscular pains	Massage	14
Malvaceae	<i>Malva sylvestris</i>	Khoubiz	S, Fl, FR, L /Respiratory disorders (Asthma cough), Digestive disorders (Colon Ulce, Genitourinary disorders (Gynecological infections)	Oral / Massage / Rinsing / whitewashing	7
Lamiaceae	<i>Marrubium vulgare</i>	Marriout	L /Fever in children, hypoglycemic, hepatic disorders	Oral / Massage / Rectal way	14
Lamiaceae	<i>Mentha suaveolens</i>	Mergucèfe	L, W.P / Osteo-articular disorders, Digestive disorders (gas), Psoriasis, Influenza	Oral / Steam / poultice	5
Ericaceae	<i>Arbutus unedo</i>	Lendj	S, FR, L /Cardiovascular Diseases (Decreased Blood Pressure)	Oral	2
Anacardiaceae	<i>Pistacia lentiscus</i>	Droo	L /Influenza (Allergy, Asthma), Healing, Osteoarthritis, Digestive Disorders	Oral/Massage	10

Table 4. Results of parameters considered in the study.

Demographic profile		Therapeutic profile	
Age group	%	Method of preparation %	
20-39	44	Infusion	25
40-59	44	Decoction	11
60-79	11	Poultice	18
80-99	1		
		Forme of use	
Sex		Herbaltea	46
Male	49	Powder	25
Female	51	Essential oil	19
		Administration mode	
Education status		Oral	51
Illiterate	17	Massage	27
Primary	11	Skin exposure	12
Secondary	34	Rising mark	10
Universitary	38		
		Dose	
Marital status		Spoonful	58
Single	31	Handful	42
Married	69	Pinch	0
Profession			
Users	46	Duration of treatment	
Herbalists	42	Untilhealing	42
T. healers	12	Month	14
		Week	24
Therapeutic indications		Day	20
Type of medicine		Origin of information	
Traditional	78	People	56
Modern	22	Doctor	4
		Herbalist	40
Use of plants			
Therapeutic	69	Perception results	
Cosmetic	19	Healing	65
Food	12	Improvement	35
		Inneficace	0
Plant type			
Toxic	19		
Non-toxic	81		

Table 5. Frequencies of specific use of the spontaneous plants most used in the treatment of the different affections. Abbreviations are: NSA, Number of species by category of affections; SFU, Specific frequency of use.

NSA	SFU	Most Used Species
Digestive diseases (24)	82,75%	<i>Origanum vulgare</i> subsp. <i>glandulosum</i> <i>Quercus ilex</i> <i>Linum usitatissimum</i> <i>Teucrium polium</i> <i>Rosmarinus officinalis</i> <i>Lavandula stoechas</i> <i>Pistacia lentiscus</i> <i>Ajuga iva</i>
Respiratory diseases (28)	96,55%	<i>Origanum vulgare</i> subsp. <i>glandulosum</i> <i>Rosmarinus officinalis</i> <i>Lavandula stoechas</i> <i>Mentha pulegium</i> <i>Pistacia lentiscus</i> <i>Marubium vulgare</i>
Dermatological diseases(26)	89,65%	<i>Pistacia lentiscus</i> <i>Daphne gnidium</i> <i>Nerium oleander</i> <i>Origanum vulgare</i> subsp. <i>glandulosum</i>
cardiovascular disease (22)	75,86%	<i>Crataegus monogyna</i> <i>Linum usitatissimum</i> <i>Cupressus sempervirens</i> <i>Rosmarinus officinalis</i>
metabolic diseases (24)	82,75%	<i>Linum usitatissimum</i> <i>Marubium vulgare</i> <i>Centaurea calcitrapa</i>
Genitourinary diseases (25)	86,20%	<i>Erica arborea</i> <i>Origanum vulgare</i> subsp. <i>glandulosum</i> <i>Quercus ilex</i> <i>Lavandula stoechas</i> <i>Drimia maritima</i>
Osteo-articular diseases (23)	79,31%	<i>Capparis spinosa</i> <i>Thapsia garganica</i> <i>Dittrichia viscosa</i> <i>Linum usitatissimum</i>
Neurological diseases (20)	68,96%	<i>Mentha spicata</i> <i>Lavandula stoechas</i> <i>Rosmarinus officinalis</i> <i>Origanum vulgare</i> subsp. <i>glandulosum</i> <i>Nerium oleander</i>
Diseases of the glands (11)	37,93%	<i>Ajuga iva</i> <i>Origanum vulgare</i> subsp. <i>glandulosum</i>

Discussion

The results obtained have shown that there is a floristic richness associated with a diversified use of medicinal plants, which is juxtaposed with the cultural context of the localities of the Setifian Tell region. Indeed, with an inventory of 101 spontaneous species distributed over 97 genera and 38 families, we have been able to observe floristically the predominance of Asteraceae, Fabaceae, and Lamiaceae families. These families have many medicinal plants.

These data treatments show that a specific richness of these families goes in the direction of most of the floristic works carried out in the Algerian forests, which confirm the richness of the flora of the

Tell region according to several taxonomic assessments (El Mechri, 2014). The studied area belongs to several chorological ensembles; the most important is the Mediterranean ensemble. Besides, the co-dominance of hemicryptophyte (42%) and therophyte (31%) could be explained by the importance of human activity, particularly due to overgrazing and grazing, which limits the regeneration of forest tree species and leads to a reduction in vegetal cover (Messaoudene *et al.*, 2007). Hemicryptophyte marks the highest rate; this is linked to a characteristic of humid Mediterranean forests (Gharzouli, 2007). The presence of therophyte, on the other hand, is due to a characteristic of arid Mediterranean zones where high water stress dominates (Médail & Myers, 2004).

Most of the listed species are common to tell. There are 15 rare species sensu Quézel & Santa 1962, and we note the presence of two North African endemic species: *Genista tricuspoidata* and *Galium tunetanum*. *Origanum vulgare* subsp. *glandulosum* is exclusively Algerian-Tunisian with *Quercus afares*, which is a Numidian endemic species. It remains, however, that a study of the elementary structures of its stands and plant associations could reveal more information on the actual vegetation situation of the Tamentout forest (Bouchibane *et al.*, 2017).

In general, the frequency of use of medicinal plants depends on the profile of the respondent. It has been noted that the practice of traditional medicine in our region has become the prerogative of herbalists (62% of herbalists against 33% of users), mainly for the district of Setif. On the other hand, a large number of users in rural populations testifies to the extent of this practice (29% of the users against 14% of the herbalists). The most experienced people in the field of medicinal plants are aged 20 to 59, with extremes of up to 86 years. This result is similar to that reported by (El hilah *et al.*, 2016). This category of people is interested in plants not only through scientific information, but they are also good users who acquire their knowledge through their ancestors and their families (Sari *et al.*, 2014). Women are better acquainted with medicinal plants; this is due in particular to the exchanges, which unite them, and to the oral transmission which is made from generation to generation (Benkhnigue *et al.*, 2011; Medjati *et al.*, 2019). The practice of traditional medicine is more pronounced among married people than single people, which is related to the fact that the use of plants is of much greater interest to households, who use these plants to give first aid to their children (El hafian *et al.*, 2014).

The results of the socio-demographic profile show that the number of herbalists is becoming more important and the use of traditional medicine for rural populations who use these plants most often for personal or family and non-commercial purposes (Meddour *et al.*, 2009). All this is related on the one hand to the conditions of social life (unemployment, a declining standard of living, high cost of drugs) and on the other hand to a growing craze for a more natural drug that would probably be due to a loss of confidence in public health structures.

For therapeutic indications, the results show that leaves are the most used part. The high frequency of leaf use can be explained by the ease of harvesting but also by the fact that they are the site of photosynthesis and probably the storage of secondary metabolites responsible for the biological properties of the plant (Bitsindou, 1986). Most recipes are prepared mainly as an infusion and poultice (Slimani *et al.*, 2016). These recipes are administered orally or by massage, and the most common form of use is an herbal tea, powder, and essential oil.

We also observe in recent years that herbalists and healers (because most of them can read and write), strive to learn about therapeutic indications either by the Internet or by consulting old books of herbal medicine. Some use ancient rituals acquired during their practice, such as placing a *Marrubium vulgare* plant under the bed to treat fever and hepatitis in children (Koudokpon *et al.*, 2017).

All listed species treat a very diverse range of pathologies where diseases of the digestive and respiratory systems show the highest rate. The massive treatment of these diseases by these plants is related to the way of life or more precisely to the diet. Indeed, the population suffers particularly from problems of bloating and acidity often related to the colon. Also, the continental climate with thermal contrasts exposes the population to respiratory diseases (Influenza, Allergy, and Bronchitis) that require regular care.

It should also be noted that the toxicity of the plants used (of the order of 19%) is relatively well known in certain species, such as *Thapsia garganica*, *Nerium oleander* and *Daphne gnidium*. However, the action irritant of certain plants such as *Capparis spinosa* is not always reported, especially when one proceeds to the picking of its fruit intended for the sale.

Conclusion and Recommendations

At the end of this contribution, it seems urgent to take a constant interest in safeguarding this heritage through transcription and knowledge gathering. It is also imperative to subscribe to a sustainable exploitation option through better use of medicinal plants. This use can be promoted by raising awareness among users of the policy to be adopted to teach good plant harvesting practices, their management and in situ protection. Finally, to reduce the risk of extinction, it is useful to undertake the ecology of highly desirable species, namely rare or endangered species. All the results obtained constitute an important database for the valorization of medicinal plants and the determination of the health profile of the local and urban populations of the Tell Setifian region. Scientific validation of the therapeutic and pharmacological virtues of these plants would explain their biological effects and certify different medical practices in a traditional environment. We also aim through this study to contribute to the integration of forest management programs for a better sustainable exploitation of the flora.

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