

Update of the list of medicinal plants traditionally used in the Province of Taza

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Abstract A large number of plants have very interesting biological properties, and are found to have application in various fields, namely in medicine, pharmacy, cosmetology and agriculture. The objective of this work is to list the uses of plants in traditional medicine in unexplored areas of the province of Taza. Thus, a recent survey was conducted in the Pre-Rif of Taza (North-East of Morocco); among the rural population, between May / 2022 and January / 2023; to carry out an inventory of medicinal plants and a collection of information relating to their therapeutic uses using a questionnaire. The series of visits carried out made it possible to inventory 91 species belonging to 48 floristic families with a predominance of the following families: Lamiaceae (30%), Asteraceae (8%), Myrtaceae (6%) and Fabaceae (5%). 91 species are used to fight different pathologies: the digestive system (13%), Diabetes (10%) and Colds (9%). The leaves (57%), the aerial part (13%) and the seeds (9%) are the main parts used to prepare the recipes. Alone or in combination, these parts are involved in the development of recipes by processes mainly using infusion (36%), decoction (29%) and powder (23%). The products obtained are administered mainly orally (74%) and by external applications representing 19%.

1. Introduction

There are Approximately 500,000 species of plants on Earth, a wide range of which have medicinal properties. Despite advances in modern pharmacology and medicine, 80% of the world's population enjoys the health care benefits of traditional medicine, especially in developing countries where a modern medical system is often lacking [1].

In Africa, particularly in Morocco, the reliance on phytotherapy persists among both urban and rural populations [2, 3]. The tradition of using plants for their medicinal benefits remains deeply embedded within Moroccan culture [3]. Due to its biogeographical location, Morocco boasts a remarkably diverse ecological and floral landscape, serving as a valuable genetic reserve for plants. With approximately 4,500 species spanning 940 genera and 135 families, Morocco's mountainous regions, particularly the Rif and Atlas Mountains, stand out as significant areas for endemic plant species [4]. This biodiversity, characterized by notable endemism [5], positions Morocco favorably among Mediterranean countries known

for their extensive medical traditions and expertise in medicinal and aromatic plants [3]. The practice of traditional medicinal knowledge has been a consistent part of household routines, transmitted from one generation to the next over time [6]. Nonetheless, without protective measures in place, there is a significant risk of this invaluable knowledge fading away [7]. Hence, it is essential to safeguard and ensure the continued transmission of this knowledge for the benefit of future generations. The study of medicinal plants has attracted interest from diverse scientific disciplines, with the ethnobotanical approach playing a pivotal role. This methodology involves documenting traditional knowledge within communities and converting it into scientific insights, predominantly relying on practical expertise. As the primary discipline in this field, it offers a dependable avenue for delving into ancestral wisdom [8]. According to a checklist developed in Taza province, 202 medicinal plants are used in herbal medicine [9] and 91 species treating 14 disease groups are quantified [10].

After carrying out a bibliographic study on ethnobotanical surveys concerning the province of Taza, we noted that certain areas of the province were not taken into account. To compensate for this gap, our study focused on all of these areas, in particular the tribes of Tsoul and Branés. The main objective of this study is to inventory and identify the medicinal plants used by the two tribes, then explore the pharmacological activity and phytochemical composition of some of these plants. This approach aims to elucidate their biological effects, in order to confirm the traditional medical practices used.

2. Materials and Methods

2.1. Study Area

This study was conducted in the province of Taza, located in the northeast of Morocco, covering an area of 7,098.5 km², representing 17.71% of the total area of the region [11]. Its unique topography is marked by the meeting of the Rif and Middle Atlas Mountains. This province occupies a prominent geographical and strategic position, bordered to the north by the provinces of Driouch and Al Hoceima, to the west by the Rharb, to the east by the province of Guercif, and the south by the province of Boulemane [12].

Altitudes in this region range from 500 to 1980 meters. The temperature varies between 3.2 and 44.5°C. The climate is classified as subtropical to tropical, with arid conditions on the coast and more humidity at higher altitudes [13].

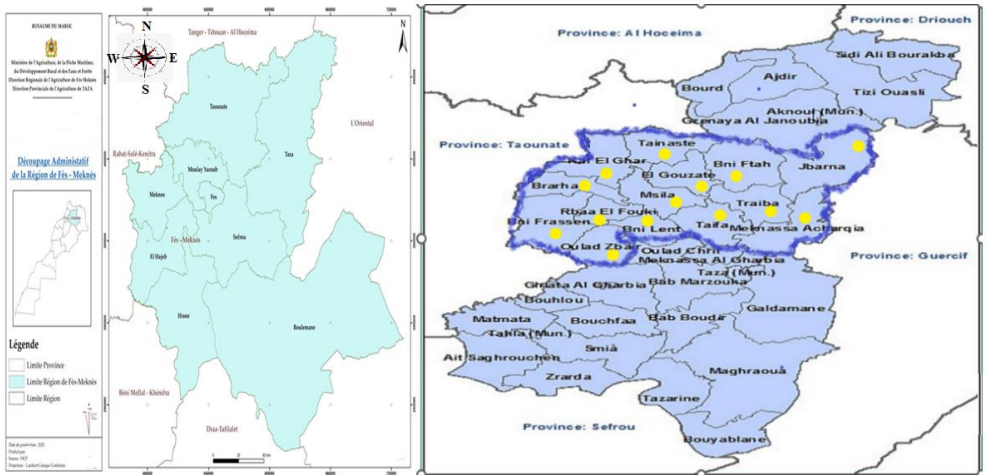


Fig. 1. Site of ethnobotanical survey [14].

2.2. Ethnobotanical Survey

An ethnobotanical investigation was carried out in less explored regions of Taza (14 stations), following a preliminary bibliographic study. A standardized questionnaire, containing specific inquiries about the informant, local names of medicinal plants, and various demographic parameters (such as age and gender), as well as ethnobotanical (including parts used and methods of use), and ethnopharmacological (preparation and administration) aspects, was utilized. Prior to data collection, informants were briefed on the study's objectives and the importance of their contributions, seeking their consent for participation. A total of 100 individuals were interviewed for this purpose.

2.3. Plant, Collection, Handling and Identification

In 2022, the utilization of plants by the local population in the region was documented across 14 stations within the commune of Taza. The identification of these plants was carried out with reference to various botanical sources including [15, 20]. Each identified plant was allocated a voucher number, as detailed in Table1 and subsequently archived in the university's Herbarium. This compilation forms an extensive database of plants utilized within the study area. The resulting data is then inputted into a database for subsequent processing and statistical analysis utilizing SPSS software.

3. Results and Discussion

3.1. Socio-Demographic Data

3.1.1. According to sex

Among all those surveyed, out of 490 people of different genders, we found that women use medicinal plants much more (63.75%) than men (36.25%). These results corroborate findings from other ethnobotanical studies conducted nationally [7, 21, 22, 23], which indicate that women have more knowledge of traditional herbal medicine. In the field of investigation, it is observed that women play an essential role in the collection, drying, storage, and preparation of medicinal plants, as well as in the formulation of remedies intended for the care of family members, as shown in Fig. 2.

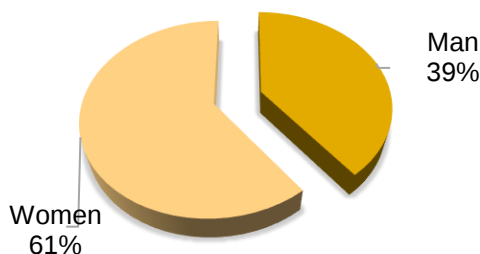


Fig. 2. Distribution of plant use rate by gender.

3.1.2. Usage of medicinal plants according to age

We have grouped the age groups into two main categories: those over 60 and those under 60. Our study revealed that the use of medicinal plants is widespread across all age groups in the study area, with a particularly marked prevalence among individuals over 60 years, who represent 60% of users, compared to the young age group, which represents 40% of users Fig. 3.

The results were consistent with previous ethnobotanical research conducted in Taza province and across various regions of Morocco [19, 24, 25, 26], reaffirming that older

individuals tend to have a deeper understanding of traditional herbal medicine practices than younger counterparts.

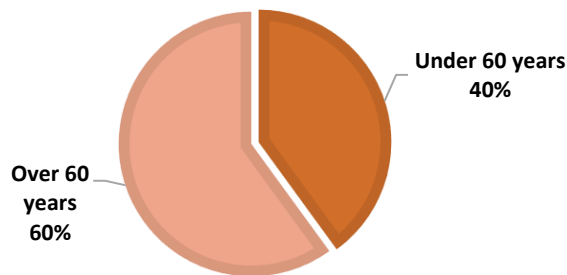


Fig. 3. Distribution of the plant use frequency according to age group.

3.1.3. Family situation and level of study

Data reveals that most users of this plant are illiterate (31,8%) and married (71,2%). On the other hand, people with a primary, secondary and university level of education represent only 24,7%, 26,3%, and 17,1%, respectively. The percentages of singles (16,1%), divorced (7,3%) and widowed (5,3%) are significantly lower than those of married people. The findings suggest that illiterate individuals may face difficulties in accessing conventional healthcare in addition to their lack of confidence in modern medical treatments compared to more educated individuals, as well as their marital status, where the prevalence of individuals married couples could arise from the transmission of traditional health practices and beliefs within the family, indicate an inherited trust in traditional remedies [25, 27, 28, 31, 32].

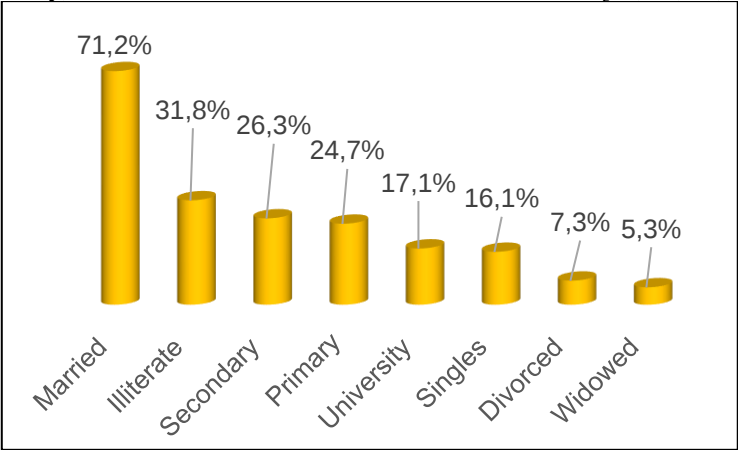


Fig. 4. Distribution of the plant use frequency according to family situation.

3.2. Systematic characterization

3.2.1. Botanical families

The botanical inventory showed that 91 plant species belonging to 48 families were identified (**Table 1**).

Table 1: Biodiversity of medicinal plants used in the study area.

Scientific name	Vernacular name	Ecological distribution	Collection period	Plant state	Part used	Forme of employment	Preparation	Administration	Dose used	Use of the plant	Reülats	Medicinals uses
Anacardiaceae												
<i>Pistacia lentiscus</i> L. (E01 T LRNE)	Dru:	S	All year	F D	L	Ht	De I	O	Sp Pi	Medicine	Improvement	Digestive system
<i>Pistacia atlantica</i> Desf. (E02 T LRNE)	Lb'a:m Lb'ja:m	S	All year	D	Sd	Pd	Pd	Ex.ap	Sp	Medicine	Ineffective	Hair treatment
Amaranthaceae												
<i>Chenopodium ambrosioides</i> L. (E03 T LRNE)	Mxinza:	S	All year	F	L	Ex Ht Lo Br	De M Pd Po Br	O Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Fever Sexual diseases O.diseases
Apiaceae												
<i>Ammodaucus leucotrichus</i> Coss. & <i>Durieu</i> (E04 T LRNE)	Lka.mu:n s'u:fi:	Id	Summer	D	Sd	Ht Pd Sy	De Pd Br	O In	Sp H Pi	Medicine	Healing Ineffective Improvement	Digestive system Intestinal pain Cold Diarrhea Diueritic
<i>Ammi visnaga</i> (L.) Lam. (E05 T LRNE)	B'jaixa:	S	Summer	D	Fr	Ex Br	M Br	O Ex.ap	Sp H	Medicine	Healing Ineffective Improvement	Hepatitis Hair treatment Influenza
<i>Anethum foeniculum</i> L. (E06 T LRNE)	Na:fðs	C Sp	Summer Spring	F D	St L Sd	Br Ht Pd	Br De I	O	Pi Sp H	Medicine Food	Healing Ineffective Improvement	Diabetes Digestive system Sexual diseases Stress
<i>Apium graveolens</i> L. (E07 T LRNE)	Lkra:fsðs	C	All year	F	L	Ht	De	O	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Digestive system Hypertension Diueritic

<i>Carum carvi</i> L. (E08 T LRNE)		Krwja :	Id	All year	F	Sd	Pd	Bo	O	Sp	Medicine	Ineffective	Aphrodisiac
<i>Coriandrum sativum</i> L. (E09 T LRNE)		Qu:zbr	C	All year	F	Ap	Ht	De	O	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Digestive system Goitre Insomnia
<i>Petroselinum crispum</i> (Mill.) Fuss (E10 T LRNE)		Mʔdʹnu:s	C	All year	F	L	Ht	De	O	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Hypertension Kidney problems kyste
Apocynaceae													
<i>Nerium oleander</i> L. (E11 T LRNE)		δʹa:fla:	S	All year	F	L	Ju Ex Ht Pd	De I Pd Dy Ju Bo	O In Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Diabetes Cold Cough
Arecaceae													
<i>Chamaerops humilis</i> L. (E12 T LRNE)		δʹoum	S	Spring Summer	D	Fr Ap	Ht	De I	O	Pi Sp H	Medicine	Healing Improvement	Digestive system Goitre
Aristolochiaceae													
<i>Aristolochia longa</i> L. (E13 T LRNE)		Brzʹa:m ha ntʹa:l	S	All year	D	Ro	Ht Sy Pd Lo	De M Pd Dy Po	O Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Digestive system Cancer Scar Mouth sores Influenza Poisoning Infection
Asparagaceae													
<i>Asparagus officinalis</i> (E14 T LRNE)		sku:m	S	Spring	D	Ro	Ht	I	O	Pg	Medicine Food	Ineffective Improvement	Cough
Asphodelaceae													
<i>Asphodelus ramosus</i> L. (E15 T LRNE)		brwa:g	S	Printemps	F D	Ro	Pd	Pd Po	Ex.ap	Sp	Medicine	Improvement Ineffective	Dermatological diseases Eczema Cancer
Asteraceae													
<i>Artemisia absinthium</i> L. (E16 T LRNE)		ʃiba:	C	All year	F	L	Br Ht Pd Lo	De I Cru Pd Dy	O Ex.ap	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Cold Microbial infection Tiredness Influenza Bone diseases
<i>Artemisia campestris</i> L. (E17 T LRNE)		ʔʃbt dʹra:s	S	All year	F	L	Br	Br	O	Sp	Medicine	Improvement	Molar pain

<i>Artemisia herba-alba</i> Asso (E18 T LRNE)	jfh	S	All year	D	L Ap	Ht Pd	De I	O	Sp H Pi	Medicine	Healing Ineffective Improvement	Diabetes Cold Cough infection Microbial Fever Tiredness Inflammation
<i>Cnicus benedictus</i> L. (E19 T LRNE)	hli:ba:	S	Spring	F D	L Sd	Pd Br	Pd Cd	O Ex.ap	Sp	Medicine Food	Ineffective Improvement	Digestive system Bone diseases
<i>Cynara humilis</i> L. (E20 T LRNE)	xjfu:f	C	Autumn	F	L	Pd	De	O	Sp	Medicine	Healing	Digestive system
<i>Inula viscosa</i> (L.) Alton (E21 T LRNE)	Ma:gra:mn	S	All year	F	L Ro Ap	Br Sy Lo Ht Ex Pd	De Pd Po Bo	O Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Tiredness Influenza Abortive Allergy Hemostatic
<i>Matricaria chamomilla</i> L. (E22 T LRNE)	Lba:bounj	S	Spring	D	Fl	Br Sy Lo Ht Ex Pd	De I	O	Sp H Pi	Medicine	Healing Ineffective Improvement	Digestive system Intestinal pain Nervous system Stress Allergy
<i>Scolymus hispanicus</i> L. (E23 T LRNE)	kerni:na:	S	Spring	D	Ro	Br	Br	O Ex.ap	Sp H	Medicine Food	Healing Ineffective Improvement	Diabetes Cardiac
Boraginaceae												
<i>Borago officinalis</i> L. (E24 T LRNE)	Bu:ha:mdu:na:	S	All year	F	W p	Br	Po	Ex.ap	Sp	Medicine	Improvement	Headache
Brassicaceae												
<i>Brassica napus</i> L. (E25 T LRNE)	La:ft	C	Winter All year	F	Ro	Ht	I	O	Sp	Medicine	Improvement	Cold
<i>Lepidium sativum</i> L. (E26 T LRNE)	Hbq:a:d	Id	Summer All year	D	Sd	Ht Pd	De I Pd	O Ex.ap	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Cold Bone diseases Digestive system
Cactaceae												
<i>Opuntia ficus-indica</i> (L.) Mill. (E27 T LRNE)	Lha:ndi:a:	S C	Spring All year	F D	Fl L Fr	Ht Lo Ju Br	De I Ju Br	O In	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Diabetes Digestive system Cold Prostate Kidney problems

Capparidaceae									
	Ka:ba:r	S	Summer	F D	L Fr Sd	Ht Pd Br	Pd Br	O	Pi
									Food
									Improvement
									Digestive system O diseases Rheumatism Fertility
Caryophyllaceae									
<i>Corrigiola telephifolia</i> Pourr. (E29 T LRNE)	S'a:ryna:	S	Summer	D	Ro	Ht Pd	De I	O Ex.ap	Sp H Pi
									Medicine
									Healing Ineffective Improvement
<i>Herniaria glabra</i> L. (E30 T LRNE)	Ha:ra:st Lh3a:r Ndga:m	S	Summer	D	Ap	Ht Pd	De I	O In	Sp H Pi
									Medicine
									Healing Ineffective Improvement
<i>Silene vulgaris</i> (Moench) Garcke (E31 T LRNE)	Ti:ya:/t	S	All year	F D	L Ro	Pd Ht Br	De Br	Fu O	Sp H
									Medicine
									Improvement
									Cough Infection Headache
Cistaceae									
<i>Cistus ladanifer</i> L. (E32 T LRNE)	Tu:za:lt	S Id	Spring	D	Sd	Br	Br	O	Sp H Pi
									Medicine Food
									Healing Ineffective Improvement
<i>Cistus salvifolius</i> L. (E33 T LRNE)	Mjiba:	S	Spring Winter	D	L	Bo	Bo	O	Sp
									Medicine
									Improvement
									Digestive system
Cucurbitaceae									
<i>Citrullus colocynthis</i> (L.) Schrad. (E34 T LRNE)	ha:nda:l	C	Summer	F	Fr	Lo Lo Ju	M Pd Ju	O Ex.ap	Sp H
									Medicine
									Healing Ineffective Improvement
									Diabetes Cancer Acne Diabetic
Cupressaceae									
<i>Tetraclinis articulata</i> (Vahl) Mast. (E35 T LRNE)	L7r:P'a:r	S	All year	F D	L	Ht Pd Br	De I Pd Br	O Ex.ap	Sp H Pi
									Medicine
									Healing Ineffective Improvement
									Cancer Diabetes Digestive system Cold Hair treatment Sexual diseases
Euphorbiaceae									
<i>Euphorbia resinifera</i> O. Berg (E36 T LRNE)	ø'a:ymu:s	Id	All year	D	W p Ap	Ht Pd Ju	De I Pd Ju	O In	Sp H
									Medicine Food
									Healing Ineffective Improvement
									kyste Diabetes Cold Asthma Fever Cancer Nervous system Goitre Fertility
Fabaceae									
<i>Ceratonia siliqua</i> L. (E37 T LRNE)	xa:roub	S	Summer	D	Fr	Ht Pd Br	De Pd Br	O	Sp H Pi
									Medicine
									Healing Ineffective Improvement
									Digestive system Microbial infection Sexual diseases O diseases

<i>Glycine max (L.) Merr.</i> (E38 T LRNE)	Soga:	Id	Summer	F	Sd	Ht Sy	De Pd	O Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Cardiac Tiredness Aperiitif
<i>Glycyrrhiza glabra L.</i> (E39 T LRNE)	¶ra:q su:s	Id	All year	D	Ro	Ht	I	O	Sp	Medicine	Improvement	Intestinal pain Tiredness Inflammation Allergy Helicobacterium
<i>Lupinus albus L.</i> (E40 T LRNE)	Trmi:s	Id	Summer	D	Fr	Pd	I	O	Sp	Medicine	Improvement	Diabetes
<i>Trigonella foenum-graecum L.</i> (E41 T LRNE)	Ha:lba:	C	Summer	D	Sd	Ht Pd Br	De I Br	O Ex.ap	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Hypertension Diabetes Digestive system Cold Tiredness Aperiitif Allergy Weight gain
Fagaceae												
<i>Quercus ilex L.</i> (E42 T LRNE)	Kuri:ƒ	S	All year	D	B	Ht	De	O	Sp	Medicine	Ineffective	Digestive system
<i>Quercus suber L.</i> (E43 T LRNE)	Lblout'	S	Autumn	F D	Fr Ro	Ht Pd Ju Br	De Bo Br	O Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Diabetes Digestive system Cancer Sexual diseases
Iridaceae												
<i>Crocus sativus L.</i> (E44 T LRNE)	Zʔ:fa:n lhu:r	C	Autumn	F	Fl	Ht	I	O	Sp	Medicine Food	Ineffective	Nervous system Fertility
Juglandaceae												
<i>Juglans regia L.</i> (E45 T LRNE)	Swa:k	C Id	All year	D	P	Ht Br	De Br	O Ex.ap	Pi H	Medicine	Ineffective	Dental pain Hair treatment
Jurcarcae												
<i>Juncus acutus L.</i> (E46 T LRNE)	Sma:r	S	All year	D	Fl	Ht Pd	I Pd	O Ex.ap	Sp	Medicine	Ineffective	Digestive system Dermatological diseases
Lamiaceae												
<i>Ajuga iva (L.) Schreb.</i> (E47 T LRNE)	Jndgu:ra	S	Summer	F	L Ap	Ht	De I	O	Sp H Pi	Medicine	Healing Ineffective Improvement	Diabetes Hypertension Digestive system Anemia Pulmonary inflammation Hair treatment Influenza Sexual diseases
<i>Calamintha spMoench</i> (E48 T LRNE)	Ma:nta:	S	All year	D	L Ap	Ht Pd	De I	O	Pi Sp H	Medicine	Healing Ineffective	Digestive system Cold Cough Fever Dental pain Sexual

												diseases
	xza.ma:	S	All year	F D	Fl Ap	Ex Ht Pd	De I M Pd Ju	O In Ex.ap	Sp H Pi	Medicine	Healing Ineffective Improvement	Inflammation Headache
Lavandula officinalis L. (E49 T LRNE)		S	All year	D	L	Ht	De	O	Sp H	Medicine	Healing Improvement	Digestive system Cold Microbial infection Fever Respiratory system Cancer Hair treatment Sexual diseases Bone diseases Urinary diseases Rheumatism
Lavandula stoechas L. (E50 T LRNE)	ha:lha:l	S	All year	D	L St	Ht Pd	De I	O	Sp H Pi	Medicine	Healing Ineffective Improvement	Respiratory system Diabetes Digestive system Cold Cough Cancer Hepatitis Poisoning
Marrubium vulgare L. (E51 T LRNE)	Ma:rri:wa:	S	All year	D	L Ap	Ht Pd	De I Pd	O Ex.ap	Pi Sp H	Medicine Food	Healing Improvement	Cold Respiratory system Scar Urinary diseases
Mentha pulegium L. (E52 T LRNE)	Fl:i:u:	S	Summer	D	L Ap	Ht	De	O	Pi Sp H	Medicine Food	Improvement	Digestive system Cold Tiredness Sexual diseases O.diseases Headache Goitre Poisoning Influenza Fever Respiratory system
Mentha suaveolens Ehrh. (E53 T LRNE)	Tl:mrsi:t'a:n M[a:j]ru:	S	Spring	F D	L Ap	Ht	De I	O	Pi Sp H	Medicine Food	Ineffective Improvement	Depression Respiratory system Analgesic
Mentha viridis (L.) L. (E54 T LRNE)	Eaʔna:ʕ	S C	All year	F	Ap	Ht	I	O	Sp	Medicine	Ineffective	Digestive system Hypertension Cold Cough Depression Cancer Acne Influenza Sexual diseases O.diseases Poisoning Allergy
Ocimum basilicum L. (E55 T LRNE)	Lhbba q	C	Spring All year	F	L	Ht	De I Po Bo	O In	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Diabetes Digestive system Cold Cough Microbial infection Fever Respiratory system Poisoning Aperitlf Headache Antiseptic
Origanum majorana L. (E56 T LRNE)	Mar.da:dof	S	Summer	D	L	Ht Pd	De I	O	Sp H	Medicine Food	Heating Improvment	Diabetes Digestive system Cold Cough Microbial infection Fever Respiratory system Poisoning Aperiitf Headache Antiseptic
Origanum vulgare L. (E57 T LRNE)	Zʔva:r	S	All year Summer	D	L Ap	Ht Pd	De I Pd	O Ex.ap	Sp H Pi	Decorati ve product	Healing Ineffective Improvement	Diabetes Hypertension Digestive system Cold Cough Microbial infection Immune deficiency Blood circulation
Rosmarinus officinalis L. (E58 T LRNE)	A:zi:r	S	All year	D	L	Ht Pd	De I	O Ex.ap	Sp H Pi	Medicine Food	Healing Ineffective Improvement	Diabetes Hypertension Digestive system Cold Cough Microbial infection Immune deficiency Blood circulation

<i>Salvia officinalis</i> L. (E59 T LRNE)	S'a.lmi:a:	C	All year	F	L Ap	Ht Pd	De I	O Ex.ap	Sp H Pi	Medicine	Healing Improvement Ineffective	Sexual diseases Diabetes Digestive system Liver diseases Influenza Bone diseases
<i>Thymus pygmaeus</i> L. (E60 T LRNE)	Z'p'i't'a:	S	All year	D	L Ap	Ht Pd	De I	O	Sp H Pi	Medicine Decorative product	Healing Ineffective	Digestive system Cold Microbial infection
Lauraceae												
<i>Cinnamomum cassia</i> Lour. (E61 T LRNE)	ka_r'a:	Id	Summer	D	Ro St	Ht Pd	De I Pd	O	Sp H Pi	Medicine Food Decorative product	Healing Improvement Ineffective	Diabetes Digestive system Microbial infection Blood circulation O.diseases
<i>Laurus nobilis</i> L. (E62 T LRNE)	Si'dna: mu:sa:	C	Spring	D	L	Pd	De	O	Sp	Decorative product	Improvement	Rheumatism Influenza
Liliaceae												
<i>Allium sativum</i> L. (E63 T LRNE)	Θu.ma:	C	Summer	F	Bu	Ht Pd	De	O Ex.ap	Sp H Pi	Medicine Food	Healing	Diabetes Poisoning Osteoporosis Cancer Intoxication Alzheimer
<i>Muscari comosum</i> (L.) Mill. (E64 T LRNE)	Bs'i:la:	S	All year	F	Bu	Ht	De	O	Pi	Medicine	Improvement	Digestive system
Linaceae												
<i>Linum usitatissimum</i> L. (E65 T LRNE)	Za.r'i'ti Lkta:n	C Id	Summer	D	Sd	Ht He Pd	De Pd	O Ex.ap	Sp H Pi	Medicine	Healing Improvement Ineffective	Diabetes Digestive system Hair treatment Sexual diseases Allergy
Lythraceae												
<i>Lawsonia inermis</i> L. (E66 T LRNE)	hna:	C	All year	D	L	Ht Pd	De I Pd	O Ex.ap	Sp H Pi	Medicine	Healing Ineffective	Dental pain Hair treatment Burns
Malvaceae												
<i>Hibiscus sabdariffa</i> L. (E67 T LRNE)	Ka.rka.d'i:l	Id	Spring	D	Fl	Ht Pd	De I	O	H	Medicine	Healing Ineffective	Diabetes Hypertension Stress
Myristicaceae												

<i>Myrsitca fragans</i> Houtt. (E68 T LRNE)	<i>Ju:za:</i>	C	Autumn	D	Sd	Pd	Pd	O	Sp	Medicine Food	Ineffective	Digestive system Abortive
<i>Eucalyptus globulus</i> Labill. (E69 T LRNE)	<i>ka:li:tu:s</i>	S	All year	F	L	Ht Ex	I Ju	In Fu	Sp H	Medicine	Healing Improvement Ineffective	Cold Microbial infection Analgesic Influenza Antiseptic COVID19
<i>Eugenia caryophyllata</i> Thunb. (E70 T LRNE)	<i>ku:njfa:l</i>	Id	Spring Summer	D	Fr	Ht Pd	De I Pd	O	Pi Sp H	Medicine Food	Healing Improvement Ineffective	Cold Dental pain Influenza Bone diseases Urinary diseases Inflammation Rheumatism Antiseptic
<i>Myrtus communis</i> L. (E71 T LRNE)	<i>Ra:i:ha:n</i>	S	Spring Summer	D	L	Ht Pd	De I	O	Sp H	Medicine	Healing Improvement Ineffective	Hypertension Digestive system Cancer Tiredness Stress
Oleaceae												
<i>Olea europaea</i> L. subsp. <i>Europaea</i> (E72 T LRNE)	<i>Iba:ri:</i>	S	All year	F	L	Ht	De	O	Sp	Medicine	Ineffective	Diabetes
<i>Olea europaea</i> L. var. <i>sativa</i> (E73 T LRNE)	<i>Zi:tu:n</i>	C	All year	F	L	Ht Lo Pd	De M	O Ex.ap	Pi Sp H	Medicine	Healing Improvement Ineffective	Diabetes
Papaveraceae												
<i>Papaver rhoeas</i> L. (E74 T LRNE)	<i>Bi?na:n</i>	C	Spring	D	Fl	Ht Pd	I Bo	O Ex.ap	Sp H	Medicine	Healing Improvement Ineffective	Intestinal pain Cold Cancer
Pinaceae												
<i>Pinus halepensis</i> Mill. (E75 T LRNE)	<i>Ta:jda:</i>	C	All year	D	L	Ht	De I Pd	Ex.ap	Sp	Medicine	Improvement Ineffective	Digestive system Cold cough Diarrhea Bum
Plantaginaceae												
<i>Plantago major</i> L. (E76 T LRNE)	<i>Ms'a:s'a:</i>	S	All year Spring	F D	L	Pd	Pd	Ex.ap	Sp	Medicine	Improvement Ineffective	Dermatological diseases Intestinal pain
Poaceae												
<i>Cenchrus spicatus</i> (L.) Cav. (E77 T LRNE)	<i>i:la:n</i>	Id	Autumn	D	Sd	Ht	Pd	O	Sp	Medicine	Ineffective	Bone diseases
<i>Zea mays</i> L. (E78 T LRNE)	<i>du:ra:</i>	C	Summer	D	Fr p	Ht Br	I Br	O	Sp H	Food	Ineffective	Diabetes Intestinal pain Cough
Polygonaceae												
<i>Emex spinosa</i> (L.) Campd. (E79 T LRNE)	<i>hu:ma:jda:</i>	S	Summer	F	Ap	Ht	De	O	Sp H	Medicine Food	Healing Improvement Ineffective	Diabetes Digestive system Tiredness Liver diseases

Punicaceae													
<i>Punica granatum L.</i> (E80 T LRNE)	<i>Rma:n</i>		C	Autumn	D	Pe P	Ht Pd	De Pd Dy Bo	O Ex.ap	Sp H	Medicine Food	Healing Improvement Ineffective	Digestive system Cancer Tiredness Hair treatment Mouth sores Influenza Sexual diseases
Ranunculaceae													
<i>Nigella sativa L.</i> (E81 T LRNE)	<i>Sa:nu.dg</i>		Id	Summer	D	Sd	Ht Sy Pd	De Pd Dy	O In	Sp H	Medicine	Healing Improvement Ineffective	Diabetes Digestive system Cold Cardiac Nervous system Influenza Poisoning Aperitlf Allergy
Rhamnaceae													
<i>Ziziphus lotus (L.) Lam.</i> (E82 T LRNE)	<i>ð'ra: nba:g</i>		S	Summer	D	L Fr	Br Ht Pd	De Pd Dy Bo Br	O Ex.ap	Sp H	Medicine	Improvement Ineffective	Diabetes Digestive system Intestinal pain Microbial infection Kidney problems Cancer Tiredness Sexual diseases
Rosaceae													
<i>Crataegus monogyna Jacq.</i> (E83 T LRNE)	<i>Zp'ru:r</i>		S	Autumn	D	L	Ht	De	O	H	Food	Improvement	Digestive systema
<i>Rosa centifolia L.</i> (E84 T LRNE)	<i>Lwa:rd</i>		C	Spring	D	Fl	Ht	De Pd Dy	O	Sp	Medicine	Improvement	Digestive system Cold Fever Hair treatment Sexual diseases Bone diseases
Rutaceae													
<i>Ruta montana (L.) L.</i> (E85 T LRNE)	<i>Fi:dgl</i>		Id	Summer	D	Ro Ap	Ht	De Pd Dy	O	H	Medicine	Improvement	Intestinal pain Abortive
Solanaceae													
<i>Lycium barbarum L.</i> (E86 T LRNE)	<i>P'a:wfi:f</i>		S	Spring Winter	F	L	Ex	G	Ex.ap	H	Medicine	Healing	Eye diseases
Thymelaeaceae													
<i>Daphne genkwa L.</i> (E87 T LRNE)	<i>La:za:z Mma:n</i>		S	Summer	D	L	Pd	De Pd Dy Bo	Ex.ap	Sp	Medicine	Improvement Ineffective	Hair treatment Cancer
Urticaceae													
<i>Urtica dioica L.</i> (E88 T LRNE)	<i>ha:r i:ga:</i>		S	Spring	F D	L Ro	Ht Pd	I Bo	O	Sp H	Medicine	Healing Improvement Ineffective	Diabetes Cough Respiratory system Cancer Diarrhea Bone diseases Allergy
Verbenaceae													

Aloysia citrodora Palau (E89 T LRNE)	Lwi:za:	C	Summer	D	L	Ht Pd	De I	O In	Sp H	Medicine	Healing Improvement Ineffective	Hypertension Digestive system Cold Respiratory system Tiredness Stress
Peganum harmala L. (E90 T LRNE)	harmal	S	Summer	F D	Ap	Ht Pd	M Pd	O Fu	Sp Pi	Medicine	Ineffective	Diabetes Insomnia Epilepsy
Zingiber officinale Roscoe (E91 T LRNE)	Skingbi:r	Id	Summer	D	Rh	Ht Pd Sy	De Pd	O In	Sp H	Medicine	Healing Improvement Ineffective	Cardiac Cold Influenza Poisoning

Ap Areal Plant **B** Bark **Bo** Boiled **Br** Brute **Bu** Bulb **C** Cultivated **Cd** Cooked **Cr** Cream **D** Dry **De** Decoction **Dy** Dyeing **Ex** Extract **Ex.ap** External
app **F** Fresh **Ff** Flowers **Fr** Fruit **Fu** Fumigation **G** Grinding **H** Handle **He** Huile essential **Ht** Herbal tea **I** Infusion **Id** Introduced **In** Inhalation **Ju**
Juice **L** Leaves **Lo** Lotion **M** Maceration **O** Oral **P** Peel **Pd** Powder **Pe** Pericarp **Pi** Pinch **Po** Poultice **Rh** Rhizomes **Ro** Roots **S** Spontaneous **Sd** Seeds
Sp Spoonful **St** Stem **Sy** Syrup **Wp** Whole plant

The ethnobotanical survey carried out in the two Tsoul and Branes tribes, located in the province of Taza, made it possible to report numerous species of medicinal plants used by the local population to treat various ailments. These results are compiled in Table 3, providing details such as scientific names, reference numbers, genera and parts of the plants used. Our study enabled the identification of 93 species distributed in 48 families. Analysis of this list reveals the predominance of the Lamiaceae family with 29,6%, followed by the Asteraceae, Myrtaceae, Fabaceae and Apiaceae families with 8,5%, 6,3%, 4,8% and 4% species respectively. On the other hand, the other families are less represented, with the number of species varying from 1 to 4. The predominance of Lamiaceae and Asteraceae is in good agreement with previous ethnobotanical surveys conducted in northern Morocco [9, 25, 33, 34, 35, 36] and other region of Morocco [24, 37, 38, 39].

3.2.2. Species Medicinal
Our survey showed that the most plants used in the Pre-Rif were *Origanum* sp, *Eucalyptus globulus* Labill., *Rosmarinus officinalis* L. and *Lavandula officinalis* L. The results found agree with previous studies [35, 36, 40].

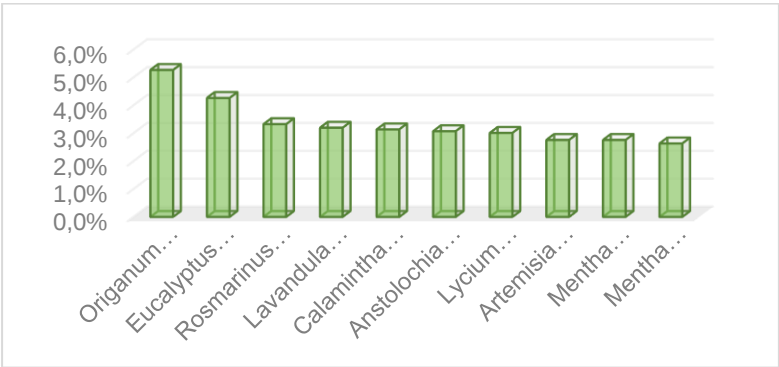


Fig. 5. Most cited species in the study area.

3.3. Ecological Distribution
3.3.1. Type of Plant
The results of our ethnobotanical study revealed that the majority of the recorded plants are spontaneous (67%), while 22% are cultivated, and 11% are imported. This preference for spontaneous plants can be explained by their constant availability throughout the year, thus highlighting the critical importance of local natural resources. These results are consistent with other studies [9, 41, 43], confirming the richness of traditional knowledge and sustainable practices linked to the use of local resources.

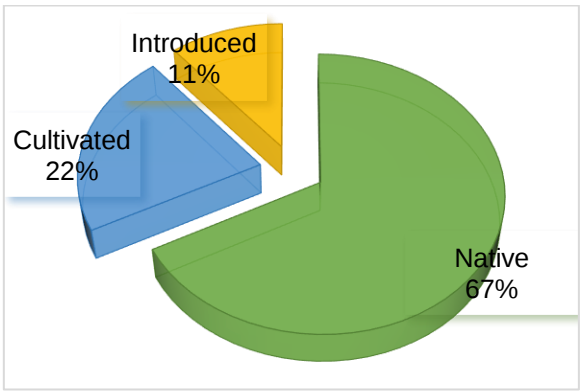


Fig. 6. Most types of plants are used in the study area.

3.3.2.Commonly Treated Diseases and Diagnostic

Our study shows that the majority of those surveyed use medicinal plants for various health concerns, with 29 % using them for digestive issues, 25.6% for fever, and 20.8% for diabetes. Other participants reported moderate usage for conditions such as cancer (9%), and respiratory system (8.8%). These results are consistent with previous studies conducted in various regions of Morocco and outside Morocco [6, 7, 10, 24, 28] [33 - 38] [44 - 48], particularly with regard to predominant pathologies such as those affecting the digestive system.

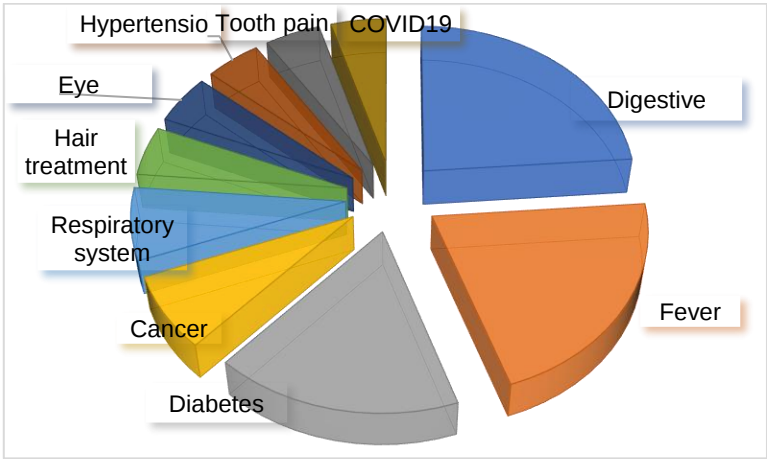


Fig.7. Illustration of Commonly Treated Diseases.

3.3.3.Part Used

The results reveal that leaves are the most used part, at 57%, which aligns with other studies [7, 35, 36, 40, 45, 47, 49, 50, 51], However, the aerial plant comes second with 13%, followed by seeds 9% and Roots 8%. This can be attributed to the fact that leaves are the place of photosynthesis and storage of secondary metabolites responsible for biological properties [46, 52] thus making them accessible and easy to obtain quickly.

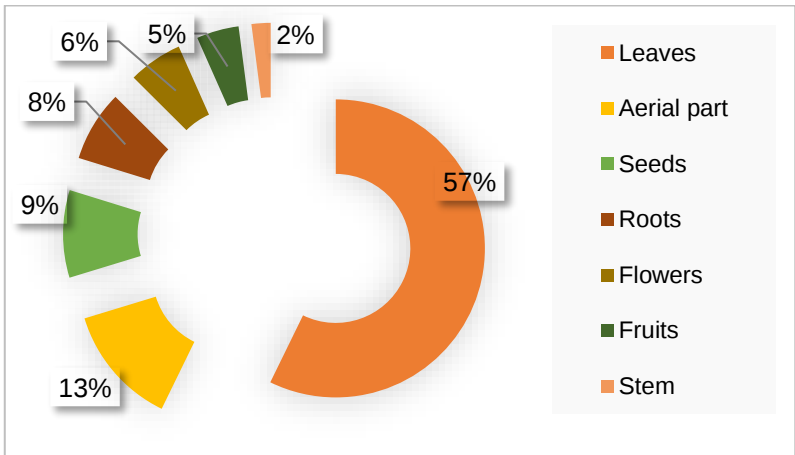


Fig.8. Most cited species in the study area.

3.4. Preparation Method

3.4.1. *Used Parts, Methods of Preparation, and Modes of Administration.*

In our study area, infusion, decoction and grinding are the main methods of preparing medicinal plants, representing 36.1%, 29.6%, and 23.3%, respectively. Other methods such as boiling, maceration, essential oil use, poultices and juicing are also used, but at rates that do not exceed 4%. These results may be explained by the fact that the first three methods are easy and quick to prepare, making them attractive to those looking for quick relief. On the other hand, other methods often require additional steps or the use of specific materials, which could explain their lesser use in this region. The result is consistent with several previous studies emphasizing that decoction, infusion and grinding are the predominant methods of plant preparation [7, 36, 40, 47, 53]. This highlights the importance of processes that extract beneficial properties from plants for various uses.

The majority of remedies were administered orally, respectively 73.7%, mainly in the form of herbal tea 62%. Then in powder form 19% for external use with 19% while inhalation and fumigation and other forms such as crude, extraction and essential oil do not exceed 7%. Similar results have been obtained in other studies [28, 29, 33, 36, 38, 48, 54, 55, 56].

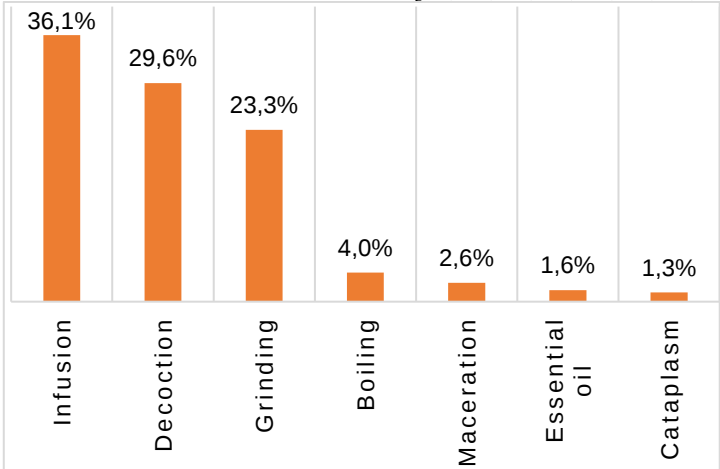


Fig.9. Preparation method of medicinal plants used in the study area.

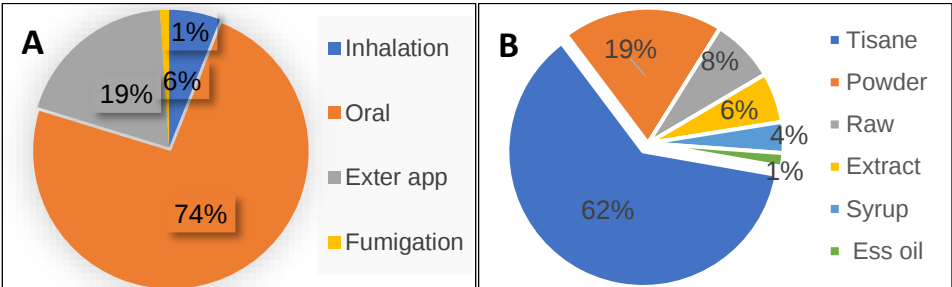


Fig.10. Administration method of medicinal plants used in the study area (A) Form of employment of medicinal plants used in the study area (B).

4. Conclusion

The ethnobotanical survey carried out in the tribes of the province of Taza, in the northeast of Morocco, revealed a wealth and diversity of medicinal plants used to treat various conditions. The study included 490 participants, providing information on 48 families across 91 plant species. In particular, the Lamiaceae and Asteraceae families seem to be the most frequently cited, with *Origanum* sp and *Eucalyptus globulus* Labill. Being the predominant species widely used in the treating digestive systems, fever, and diabetes. These conditions are treated mainly by the foliage, which constitutes the most used plant organ, and by the decoction, which represents the most common and dominant method of preparation in traditional herbal medicine. A remarkable observation is the similarity in the parts of the taxa used, as well as in the methods of preparation and administration, between the two tribes. This suggests a common base of ethnobotanical knowledge shared between these groups. This highlights the importance of preserving and promoting this ancestral knowledge, not only for its cultural value, but also for its potential in terms of traditional medicine and biodiversity conservation. The aim is to continue this research to preserve cultural diversity and the richness of flora; while contributing to developing of new approaches to traditional medicine and ecosystem conservation.

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