



## Traditional Medicinal Plants Applied for the Treatment of Gastrointestinal Diseases in Chlef, Algeria

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**T**HIS study aimed to document and analyze the traditional and ethnobotanical knowledge of the medicinal plants used in the treatment of gastrointestinal diseases. These group of diseases is one of the most prevalent diseases in human societies and causing significant health trouble.

The data were collected over a period of two years (2017-2019) in the state of Chlef through questionnaires and interviews of the local population. In total, 74 informants from rural populations were interviewed in different regions. The surveys allowed for the collection of sociodemographic data and traditional knowledge about medicinal plants and their use to treat gastrointestinal diseases.

The results showed that 33 plant species belonging to 22 families were widely used by the local population in the treatment of various gastrointestinal disease. Lamiaceae was the most used family (27.3%). Among all species, leaves were the most used part (50%), and decoction was the most recommended (51.4%) preparation form. In addition, stomach aches, colon problems, stomach ulcers, diarrhea, flatulence, hemorrhoids, and constipation were respectively the most treated diseases. Overall, *Myrtus communis* L. and *Tetraclinis articulata* (Vahl) Mast., were the common species used by the local population throughout the study area.

The present study presents a baseline information on the local medicinal plants that used in the treatment of gastrointestinal disease in Chlef, Algeria, Further chemical, and pharmacological studies to validate this information are needed.

**Keywords:** Algeria, Chlef, Ethnobotany, Gastrointestinal disease, Medicinal plants, Traditional medicine.

### Introduction

Despite the significant pharmacological advancements, the therapeutic use of medicinal plants is more popular worldwide, especially in developing countries (Tabuti et al., 2003). About 80% of the populations in the developing countries, especially in Africa, use traditional medicine as their primary approach of treatment (WHO, 2002).

Algeria is a real phylogenetic reservoir known for its rich and high flora diversity (Hamel et al.,

2018). Thus, numerous ethnopharmacological surveys have been carried out in various regions of the country to document and preserve indigenous knowledge and develop a strategy for biodiversity protection (Ouelbani et al., 2016; Bouasla & Bouasla., 2017; Miara et al., 2018). Through all these studies, the results showed that gastrointestinal diseases were the most important disease treated using medicinal plants (Benarba et al., 2015; Ouelbani et al., 2016).

Gastrointestinal disorders are diseases

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Received 07/04/2022; Accepted 12/12/2022

DOI: 10.21608/ejbo.2022.132173.1959

Edited by: Prof. Dr. Wafaa Amer, Faculty of Science, Cairo University, Giza 12613, Egypt.

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affecting the functions of the digestive tract, absorption of food and fluids, digestion, or excretion (Neamsuvan et al., 2012; Sulaiman et al., 2022). These disorders are caused by infections with various types of bacteria, viruses, and parasitic organisms (Mathabe et al., 2006; Karki & Tiwari, 2007). According to the World Health Organization (WHO) (2008), stomach/abdominal ache, diarrhea, dysentery, gastroenteritis, constipation, vomiting, ...etc. are the most common gastrointestinal disorders.

Few ethnobotanical studies have focused on the plants of Chlef area (Senouci et al., 2019a; Maamar Sameut et al., 2020). Thus, the study of biological resources used in traditional medicine by the local communities is necessary for the conservation of the local flora and the traditional knowledge. In this context, the present study focuses on the inventory of medicinal plants used by the local population for the treatment of gastrointestinal disorders and collects as much information as possible about the phytotherapeutic knowledge and practice in this region.

## Materials and Methods

### Study area

The study area is located in the Northeastern part of Chlef, in the East of the Dahra Mountains, part of the Tellien Atlas, which forms a bridge between the Chelliff valley to the south and the Mounts of Zeboudja, Benairia, Sidi Akkacha, Oued Goussine, Beni Haoua, and Breira. It is located between  $36^{\circ} 33' 26.7''$  and  $36^{\circ} 18' 9.5''$  N and  $1^{\circ} 12' 56.9''$  and  $1^{\circ} 42' 4.1''$  E (Fig. 1). The

area is inhabited by a rural population, mostly farmers with significant knowledge and practice of traditional medicine.

### Ethnobotanical data collection

The data were collected through ethnobotanical surveys with the local population of 4 municipalities (Zeboudja, Beni Houa, Benairia, and Berira) between the years 2017 and 2019. Totally, 74 informants were interviewed in different regions. Ethnobotanical data were collected using a structured questionnaire. This questionnaire consists of two parts, the first part concerns the informant about traditional medicine (age, sex, level of education, and family situation), and the second part was designed to obtain information concerning the medicinal plants, the used form, the prescription, and the method of preparation.

The frequency index was calculated and presented in Table 2. The frequency index is a mathematical expression of the percentage of frequency of mentioning a botanical species by informants. The frequency index was high when many informants mentioned a particular plant and low when there were few reports (Sulaiman et al., 2022). The following formula was used to calculate the frequency index (Madikizela et al., 2012):

$$FI = FC/N * 100$$

where, FI: frequency index; FC: number of informants who mentioned the use of the species & N: total number of informants.

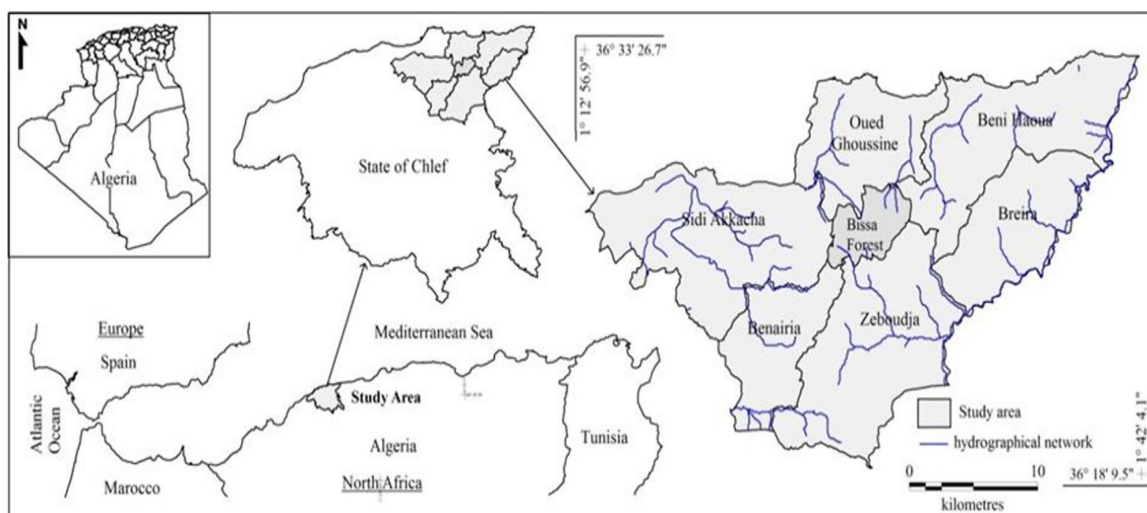


Fig. 1. Location of the study region

*Plant collection and taxonomic identification*

The plant species were collected in the field and then preserved in the herbarium of Bissa forest. Species identification was performed by using standard floras available in Algeria (Quézel & Santa, 1962-1963; Maire, 1952-1987). Identifications were updated concerning systematics, nomenclature, and chorology using the index of the database of North Africa (Dobignard & Chatelain, 2010-13).

**Results and Discussion**

The result revealed that amongst the majority of the interviewed respondents (74 respondents), were within the age range of 36–45 years and > 56 years (Table 1). This range of age is good enough to illustrate the local traditional medicine knowledge, mainly related to the older populations who have more knowledge due to their experience accumulated with age (Bouasla & Bouasla, 2017; Miara et al., 2018; Senouci et al., 2019b; Eisawi et al., 2022). Furthermore, Sulaiman et al. (2022), showed that adults in the age range of 36–45 years have very good knowledge about traditional healing of gastrointestinal diseases using plants.

**TABLE 1. Demographic survey of respondents on the medicinal plants used in treating gastrointestinal diseases**

Parameter	Specification	Number of respondents (%)
Age (years)	20-35	16 (21.62)
	36-45	22 (29.73)
	46-55	14 (18.92)
	>=56	22 (29.73)
Gendre	Male	32 (43.24)
	Female	42 (56.76)
Family status	Single	12 (16.22)
	Married	62 (83.78)
Level of education	Illiterate	28 (37.84)
	Primary	11 (14.86)
	Secondary	22 (29.73)
	University	13 (17.57)

It was also noticed that both men and women were involved in the traditional medicine, however; women were more informed about medicinal plants compared to men (56.76% versus 43.24%). This can be explained by the women's role in providing the household meals, often plant-based recipes, and

also in caring for the health of their children and other family members (Tahraoui et al., 2007).

The majority of the traditional medicine users interviewed were illiterate (37.84%). People with a primary and secondary education level represent 14.86 % and 29.73%; respectively. While, the those with a university degree represent 17.57%. The results showed a significant percentage of users with high educational levels. Indeed, according to Boughrara & Legseir (2016), these findings are related to the development of herbal medicine culture, the easy exchange of information, and the awareness of the benefits of medicinal plants.

Finally, the highest percentage of use was shown by married people (83.78%) against only 16.22% of single people. The results obtained by Mechchate et al. (2020) and El-Assri et al. (2021), showed that married people are the most knowledgeable about traditional herbal medicine.

This ethnobotanical survey collected 33 medicinal plant species belonging to 22 botanical families, used in the treatment of different gastrointestinal diseases by the local population (Table 2). In this context, Lamiaceae was the most commonly used family (9 species) with 27.3% of the total flora (Fig. 2).

An ethnobotanical survey is most useful for scientists, researchers, and scientific companies for further studies on the isolation and identification of active formulated into antibiotic drugs (Behera et al., 2021). During this survey, the most frequent plants like *Myrtus communis*, *Titracalinis articularis*, *Pistacia lentiscus*, *Punica granatum*, *Quercus ilex*, and *Lavandula stoechas* are used in the treatment of digestive disorders (Fig. 3). While, dry leaves of *Myrtus communis* are the most commonly used in the treatment of gastrointestinal troubles in the form of infusion or decoction. Young twigs of *Tetraclinis articulata*, dried, crushed, and mixed with fermented milk, are very popular preparation in the study region for treatment of the gastrointestinal troubles, diarrhea, intoxication, and infections of the digestive system. Dried and crushed leaves of *Pistacia lentiscus*, are used in solution to treat digestive system. The fruits of *Ceratonia siliqua*, *Quercus ilex*, aerial parts of *Cytisus villosus*, *Ajuga iva*, *Cistus monspeliensis*, *Lavandula stoechas* and the roots of *Taraxacum officinale* and *Asphodeles ramosus* are also widely used to treat digestive ailments.

According to Benkhigui et al. (2011) and Mehdioui, & Kahouadji (2007), *Tetraclinis articulata* (Araar) is a plant known for its therapeutic virtues, mainly used against intestinal infections (Ziyyat et al., 1997). Its use is explained by its interesting biological and therapeutic properties due to its chemical composition rich in several bioactive constituents (Bourkhiss et al., 2007). This plant possesses anti-inflammatory, antibacterial, antifungal, and stimulating activities (Ferradji, 2011).

*Myrtus communis*, called Rayhan, was mainly indicated locally in the treatment of diseases of the digestive system. In this context, the same treatment was reported by González-Tejero et al. (2008) in Italy. According to Bouasla & Bouasla (2017), this plant is used in the form of infusion or decoction to treat diarrhea in the northeast of Algeria.

*Pistacia lentiscus* (15.15%) was mainly used against the digestive system disorders. According to several studies (Longo et al., 2007; Dahmoune et al., 2014), this species is characterized by a high antioxidant capacity, where, its leaves are an important source of flavonoids, tannins, phenolic compounds, and natural pigments. The extracts of its aerial parts of this species showed the presence of terpineol, known for its significant antimicrobial activity (Ansari et al., 2012) besides its ability to inhibit mycelial growth (Barra et al., 2007).

This survey also showed that *Punica granatum*, *Quercus ilex*, and *Lavandula stoechas*

were frequently used for the treatment of diseases of the digestive system and are very effective remedies for colon disorders, ulcers, and stomach aches. In total, leaves were the most used part with about 50% (Behera et al., 2021). The other species mentioned by respondents according to their ethnobotanical uses are presented in Table 2.

In this study, 12 gastrointestinal disorders were inventoried to be treated with herbal remedies at the study area. 33 species were used to treat four main disorders: stomach aches (29.7%), colon conditions (27%), stomach ulcers (8.1%), and diarrhea (8.1%) as outlined in Fig. 4. According to Sulaiman et al. (2022), stomach ache followed by diarrhea are the most often recurring gastrointestinal disease treated by the practitioners using the medicinal plants for preparing such treatments.

### Conclusion

Chlef region, Algeria represents a large reservoir of medicinal plants, this survey showed that 33 plants belonging to 22 families have been documented for their use in the treatment of various gastrointestinal diseases, among them 6 species are the most frequently used. The valuation of medicinal plants can certainly contribute to the well-being and good health of the local population in the study area, it is, necessary to conduct chemical and pharmacological research on the documented plants to maximize its medicinal value.

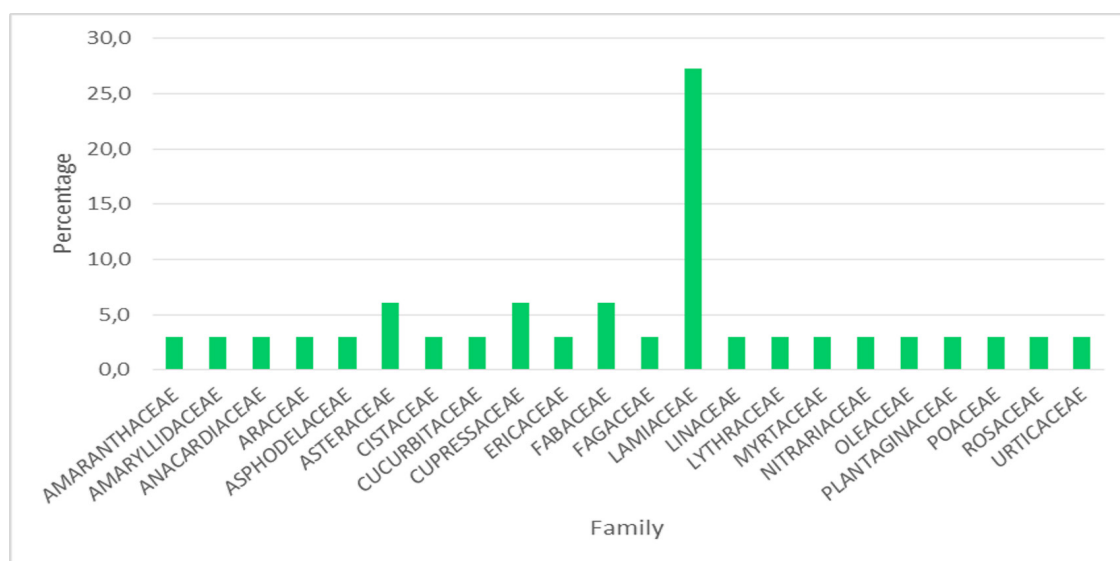


Fig. 2. Botanical families and their prevalence of traditional use for gastrointestinal diseases (Chlef; 2017-2019)

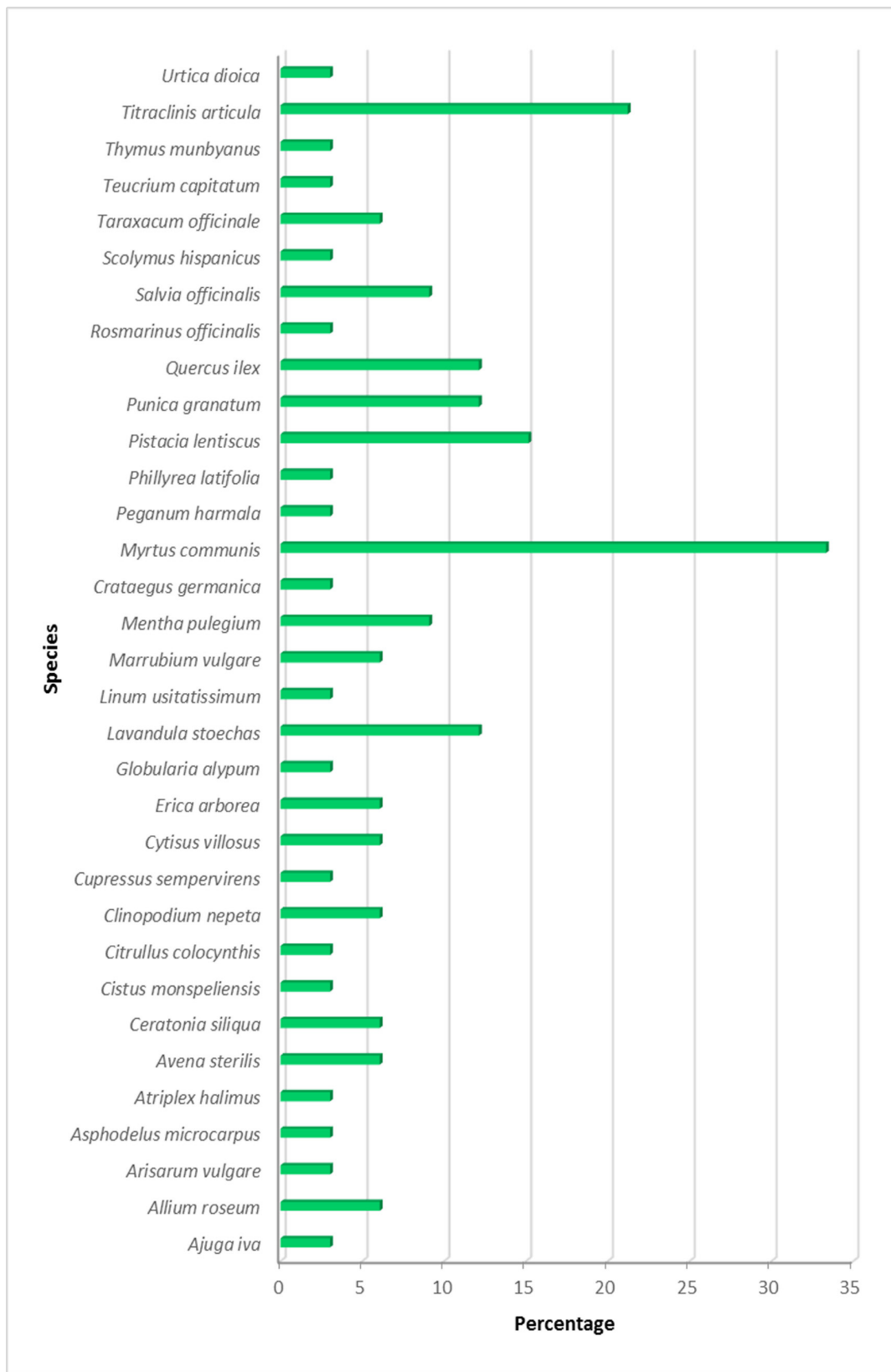


Fig. 3. Percentage of the plant species used for gastrointestinal diseases in Chlef, Algeria

TABLE 2. List of medicinal plants and its traditional uses for the treatment of gastrointestinal disorders in the region of Chlef, Algeria

Scientific name	Family	Local name	Part used	Method of preparation	Mode of Administration	Use	Frequency index (%)
<i>Ajuga iva</i> (L.) Schreb.	<i>Lamiaceae</i>	Chendgoura	Leaves, Aerial parts	Decoction, Infusion	Oral	Colon ailments, Stomach ache	1(3.03)
<i>Allium roseum</i> L.	<i>Amaryllidaceae</i>	Elthoum	Bulbs, Aerial parts	Cooked, Infusion, Poultice, Others	Oral, Massage, Rinsing	Stomach ache, Intoxications	2(6.06)
<i>Arisarum vulgare</i> O. Targ. Tozz.	<i>Araceae</i>	Elbgouga	Seeds	Infusion	Oral	Constipation	1(3.03)
<i>Asphodelus ramosus</i> L.	<i>Asphodelaceae</i>	Elbarwag	Bulbs, Roots	Poultice, Others	Others	Hemorrhoids	1(3.03)
<i>Atriplex halimus</i> L.	<i>Amaranthaceae</i>	Elktaff	Leaves	Decoction	Oral	Intoxications	1(3.03)
<i>Avena sterilis</i> L.	<i>Poaceae</i>	Elchoufan	Seeds	Others	Oral	Colon ailments, Obesity	2(6.06)
<i>Ceratonia siliqua</i> L.	<i>Fabaceae</i>	Elkharoub	Fruits	Others	Oral	Stomach ache, Diarrhea	2(6.06)
<i>Cistus monspeliensis</i> L.	<i>Cistaceae</i>	Touzala	Aerial parts, Leaves	Decoction, Others	Oral, Others	Colon ailments, Stomach ache	1(3.03)
<i>Citrullus colocynthis</i> (L.) Schrad.	<i>Cucurbitaceae</i>	Handhal	Aerial parts	Others	Massage	Hemorrhoids	1(3.03)
<i>Clinopodium nepeta</i> (L.) Kuntze	<i>Lamiaceae</i>	Elnabta	Aerial parts, Stems	Decoction, Infusion	Oral	Colon ailments, Stomach ache	2(6.06)
<i>Cupressus sempervirens</i> L.	<i>Cupressaceae</i>	Elbostan	Leaves	Decoction	Oral	Hemorrhoids	1(3.03)
<i>Cytisus villosus</i> Pourr.	<i>Fabaceae</i>	Khiyatat Lejrah	Aerial parts, Leaves	Poultice, Infusion, Others	Others, Oral	Stomach ulcer, Colon ailments, Stomach ache	2(6.06)
<i>Erica arborea</i> L.	<i>Ericaceae</i>	Elkhlilanj	Stems	Infusion, Decoction	Oral	Pinworm infection, Stomach ache	2(6.06)
<i>Globularia alypum</i> L.	<i>Plantaginaceae</i>	Tassalgha	Leaves	Decoction	Oral	Flatulence	1(3.03)
<i>Lavandula stoechas</i> L.	<i>Lamiaceae</i>	Halhal, Elkhozama	Flowers, Stems, Leaves	Decoction, Infusion, Others, Cooked	Massage, Oral, Others	Flatulence, Stomach ache	4(12.12)

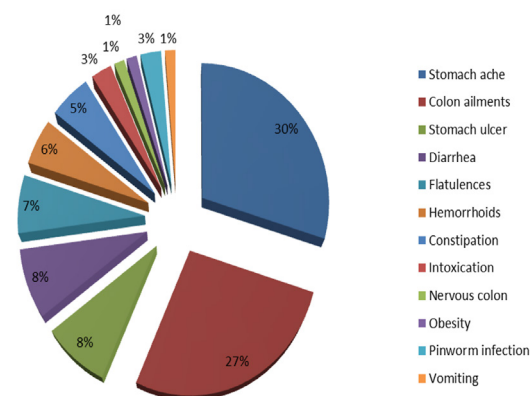
TABLE 2. Cont.

Scientific name	Family	Local name	Part used	Method of preparation	Mode of Administration	Use	Frequency index (%)
<i>Linum usitatissimum</i> L.	<i>Linaceae</i>	Elkettan	Seeds	Decoction, Others	Oral, Rinsing, Others	Constipation, Colon ailments, Stomach ache	1(3.03)
<i>Marrubium vulgare</i> L.	<i>Lamiaceae</i>	Timeriwat	Leaves, Flowers, Aerial parts, Stems	Decoction, Infusion, Cooked	Oral	Colon ailments, Hemorrhoids	2(6.06)
<i>Mentha pulegium</i> L.	<i>Lamiaceae</i>	Elfiou	Leaves	Decoction, Infusion, Poultice	Oral, Others	Colon ailments, Stomach ache	3(9.09)
<i>Crataegus germanica</i> (L.) Kuntze	<i>Rosaceae</i>	Elzaarour	Flowers, Leaves	Decoction	Oral	Stomach ache	1(3.03)
<i>Myrtus communis</i> L.	<i>Myrtaceae</i>	Elrayhan	Leaves	Decoction, Infusion, Poultice	Oral, Others	Flatulences, Stomach ulcer, Colon ailments, Stomach ache, Constipation	11(33.33)
<i>Peganum harmala</i> L.	<i>Nitirariaceae</i>	Elharmel	Seeds	Decoction, Others	Oral	Stomach ache	1(3.03)
<i>Phillyrea latifolia</i> L.	<i>Oleaceae</i>	Elktem	Leaves	Infusion, Poultice	Oral, Others	Stomach ache	1(3.03)
	<i>Anacardiaceae</i>		Leaves, Seeds, Aerial parts,	Others, Decoction, Infusion, Poultice, Others, Cooked		Nervous colon, Stomach ulcer, Vomiting, Stomach ache, Diarrhea	5(15.15)
<i>Pistacia lentiscus</i> L.		Eldharou			Massage, Oral		

TABLE 2. Cont.

Scientific name	Family	Local name	Part used	Method of preparation	Mode of Administration	Use	Frequency index (%)
<i>Punica granatum</i> L.	<i>Lythraceae</i>	Kchour Elroman	Barks	Others, Decoction, infusion, Poultice, Others, Cooked	Oral, Others	Colon ailments, Stomach ulcer, Diarrhea	4(12.12)
<i>Quercus ilex</i> L.	<i>Fagaceae</i>	Elbalout	Barks, Leaves, Fruits	Decoction, others, cooked	Oral	Stomach ulcer, Hemorrhoids, Colon ailments, Stomach ache	4(12.12)
<i>Rosmarinus officinalis</i> L.	<i>Lamiaceae</i>	Iklii Eljdjabel	Leaves, Aerial parts	Decoction, Infusion	Oral, Rinsing	Colon ailments, Stomach ache	1(3.03)
<i>Salvia officinalis</i> L.	<i>Lamiaceae</i>	Marimiya	Seeds, Leaves, Aerial parts	Infusion, Others	Oral	Stomach ache, Diarrhea	3(9.09)
<i>Scolymus hispanicus</i> L.	<i>Asteraceae</i>	Guermia	Aerial parts, stems	Decoction, Others	Oral	Colon ailments, Stomach ache	1(3.03)
<i>Taraxacum officinale</i> F.H.Wigg.	<i>Asteraceae</i>	Elhendbaa	Leaves, Roots	Infusion, Decoction	Oral	Colon ailments, Stomach ache, Constipation	2(6.06)
<i>Teucrium capitatum</i> L.	<i>Lamiaceae</i>	Eldjaida	Leaves	Infusion	Oral	Stomach ache	1(3.03)
<i>Thymus munbyanus</i> Boiss. & Reut	<i>Lamiaceae</i>	Elzaater	Aerial parts, Leaves	Others, Decoction	Oral, Rinsing, white washing	Pinworm infection.	1(3.03)
<i>Tetraclinis articulata</i> (Vahl) Mast.	<i>Cupressaceae</i>	Elarar	Leaves, Aerial parts, Fruits	Decoction, Infusion, Poultice, Others	Oral, Others	Stomach ulcer, Diarrhea, Colon ailments, Stomach ache	7(21.21)
<i>Urtica dioica</i> L.	<i>Urticaceae</i>	Elhorig El Kerras	Aerial parts	Decoction, Infusion	Oral	Flatulence	1(3.03)





**Fig. 4. Main gastrointestinal diseases treated in the Chlef region**

**Acknowledgments:** The authors are very grateful to Mr. Rezay M., for his encouragement and his facilities for carrying out this work.

**Conflicts of interest:** The authors declare no conflicts of interest.

**Authors' contributions:** Conceptualization, F.S.; methodology, F.S; S.S. and N.B.; investigation, F.S; S.S. and N.B; writing—review and editing, F.S. and A.A.; supervision, A.A. All authors have read and agreed to the published version of the manuscript.

**Ethics approval:** Not applicable.

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### النباتات الطبية المستعملة في الطب التقليدي لعلاج أمراض الجهاز الهضمي في منطقة الشلف بالجزائر

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لقد تم من خلال هذا البحث القيام بدراسة في علم الأعراق الطبية حول النباتات الطبية المستخدمة في علاج أمراض الجهاز الهضمي، والتي تعتبر واحدة من أكثر الأمراض انتشاراً في المجتمعات البشرية والتي تتسبب في إحداث مشاكل صحية كبيرة.

وقد تم جمع البيانات المطلوبة على مدى عامين (2017-2019) في ولاية الشلف من خلال استبيانات ومقابلات مع السكان المحليين. وفي المجموع، فقد تمت مقابلة 74 مبحوثاً من سكان الريف في المناطق المختلفة. وقد تم جمع البيانات الاجتماعية الديموغرافية والمعارف التقليدية حول النباتات الطبية واستخدامها لعلاج أمراض الجهاز الهضمي.

وقد أظهرت النتائج وجود 33 نوعاً نباتياً ينتمي إلى 22 فصيلة نباتية تستخدم على نطاق واسع من قبل السكان المحليين في علاج أمراض الجهاز الهضمي المختلفة. وكانت الأوراق هي الجزء الأكثر استخداماً (50٪) بينما كان الغليان هو أكثر أشكال تحضير العقار الموصى بها (51.4٪). بالإضافة إلى ذلك، كانت آلام المعدة، ومشاكل القولون، وقرحة المعدة، والإسهال، وانتفاخ البطن، والبواسير، والإمساك أكثر الأمراض شيوعاً في العلاج.

بشكل عام، فقد كان النوعين *Myrtus communis* L. و *Tetraclinis articulata* (Vahl) Mast الأنواع الرئيسية للنباتات المستخدمة من قبل السكان المحليين في جميع أنحاء منطقة الدراسة. وتشكل الدراسة الحالية مصدرًا أولياً للمعلومات حول النباتات الطبية المحلية، والتي تحتاج إلى التحقق من فعاليتها من خلال الدراسات الكيميائية والدوائية.