

MEDICINAL PLANTS USED AGAINST GASTROINTESTINAL DISORDERS IN SETIFIAN HIGH PLATEAU, ALGERIA

HANI, M.^{1*} – MERGHEM, M.² – LEBAZDA, R.¹

¹Laboratory of Natural Resource Valorization, Department of Biology and Ecology vegetable, Faculty of Nature and Life Sciences, Ferhat Abbas University Setif-1, 19000 Sétif, Algeria

²Laboratory of Phytotherapy Applied to Chronic Diseases, Department of Biology and Animal Physiology, Faculty of Natural and Life Sciences, Ferhat Abbas University Sétif-1, 19000 Sétif, Algeria

*Corresponding author

e-mail: hani.meriem@yahoo.fr; phone: +213-670-15-2019

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Abstract. An ethnobotanical survey of plants used for the treatment of gastrointestinal disorders was carried out in the region of Setifian High Plateau, Algeria. Information on the names of plants, used parts and methods of preparation was obtained from traditional medical practitioners, herbalist, hawkers in traditional medicines and rural dwellers, using semi-structured questionnaire. In studied region 50 plants belonging to 29 families (*Table 1*) were found to be used against gastrointestinal ailments. Most dominant family used against gastrointestinal complaints was Lamiaceae (8 plants) followed by Apiaceae (7 plants) and Myrtaceae, Asteraceae, Poaceae and Fabaceae (3 plants each). The rest are represented by one plant each (23 families). Among all parts of a plant, medicinal property is mainly found in the leaves (36%), followed by seeds (22%), aerial parts (14), fruits (12%), roots (6%), flowers (6%) and bulbs (4%). Also, it was determined that gastrointestinal system ailments for which the folk medicinal plants are mostly used, are as follows: constipation, diarrhea, gastritis and ulcer, intestinal winds, nausea, gastralgia and indigestion. Most of the herbal recipes were taken orally in decoction or infusion form with water, salt, and sugar. This study showed that plants are actively used for the treatment of gastrointestinal disorders in the region of Setif, Algeria.

Keywords: traditional medicine, gastrointestinal diseases, ethnobotanical survey, Setif

Introduction

Plants provide oxygen, food, shelter, medicines, fuel, gum, and environmental protection, all of which are essential to human life. Many plants have medicinal properties and active ingredients that can be used in medicine. Many useful plant species are now going extinct and are being destroyed as a result of factors like global warming, rising population, professional secrecy, a lack of government support for research, and a lack of awareness about medicinal plants (Rajani and Veena, 2018). The World Health Organization (WHO) estimates that medicinal plants are used by 65% to 80% of the world's population to treat a variety of illnesses (Salhi et al., 2019; Idm'hand et al., 2020).

Algeria, with its large area, is distinguished by a variety of climatic regions and a diversified vegetation; the more than 3139 species of wild and naturalized plants growing there become a part of a community's identity. This is due to Algeria's geographic position in the south Mediterranean basin. Part of these species were utilized by Algerians for various purposes, which can be seen in the common usage of medicinal plants by people and herbalists to cure a variety of illnesses (Bouafia et al., 2021).

Medicinal plants are used for personal healthcare and environmental landscaping. They include annual and perennial species and may be cultivated or occur in the wild. It's

important to remember that some medicinal plants only grow in certain parts of the world; Their survival may be in jeopardy if they are not properly managed (Yazdanshenas et al., 2016). Numerous authors from Arab nations, Europe, and around the world (Karaman and Kocabas, 2001; El-Hilaly et al., 2003; Sandhu and Heinrich, 2005) have recently shown renewed interest in ethnobotanical knowledge, particularly nutrition and traditional medicine. Various species have been demonstrated to be beneficial to human health, according to several studies conducted in the Mediterranean region (Meddour et al., 2010; Meddour-Sahar et al., 2010; Derridj et al., 2010; Meddour and Meddour-Sahar, 2015).

For the preservation and utilization of biological resources, ethnobotanical studies are essential for documenting local knowledge. As a result, ethnobotanical research has become increasingly useful for the creation of conservation and healthcare programs in these areas (Dogani and Ugulu, 2013). Around the world, herbalists and indigenous healers have traditionally used botanical medicines to treat and prevent various diseases. Numerous plants' therapeutic properties and efficacy as a treatment for gastroduodenal issues have been confirmed by clinical research (Devi Prasad et al., 2013).

One of the most vital organs in the body is the gastrointestinal system, which is susceptible to a wide range of diseases including parasitic and infectious disorders, diarrhea, indigestion, gastroenteritis, constipation, and bloating (Bahmani et al., 2014). Such disorders are caused by infections by various kinds of bacteria, viruses, and parasitic organisms. Stomach or abdominal pain, diarrhea, dysentery, gastroenteritis, constipation, vomiting, and other symptoms are all common gastrointestinal disorders. These disorders cause morbidity and can lead to mortality, especially in the developing world where sanitation is deficient (Dwivedi et al., 2006; Olajuyigbe and Afolayan, 2012).

This study aims to identify the plants and parts that are used to treat some gastrointestinal disorders, as well as their preparation methods and the reasons behind their tradotherapeutic effects in the Setifian High Plateau, Algeria.

Material and methods

General characteristics of the study area

This ethnobotanical survey was conducted in the province (or wilaya) of Setif, the wilaya of Setif capital of High Plateau, located in north east of Algeria (*Figure 1*), it is located between a longitude of 5° 24' 34'' East and a latitude of 36° 11' 29'' North, it occupies an area of 6504 km², limited to the north by the wilaya of Bejaia and Jijel, to the south by the wilaya of Batna and M'sila, to the east by the wilaya of Mila, and to the west by the wilaya of Bourdj BouArreridj. the relief of the province of Setif is characterized by two large zones: a mountainous zone in the north of the wilaya, where the mountains of Babor are located with a culminat point of 2004 m in altitude, and a zone of the high Setifian plains, occupying the central and meridional part of the province, with isolated mountain ranges, and chotts and Sebkhass.

The climate of the province of Setif is of the semi-arid continental Mediterranean type, it is characterized by a cool and rainy winter season and a dry and hot summer season. The rainfall pattern in the province of Setif is characterized by annual and interannual variability, with insufficient and irregular rainfall over time and space. The Babor Mountains in the north of the wilaya are the most watered with more than 700 mm of precipitation per year, the quantity decreases significantly going south of the province where annual precipitation does not exceed 300 mm. The remarkable temporal irregularity between rainy and dry years reveals an alternation of wet and dry phases (*Figures 2, 3*).

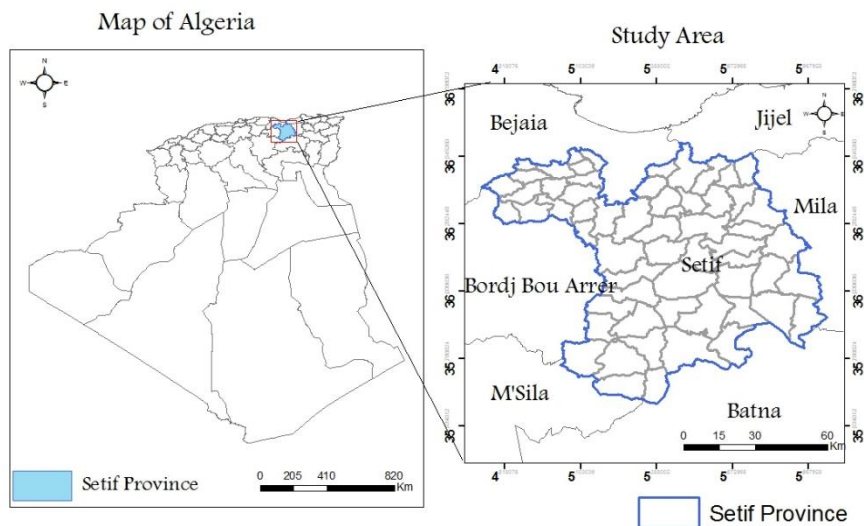


Figure 1. location of the study area (Province of Setif)

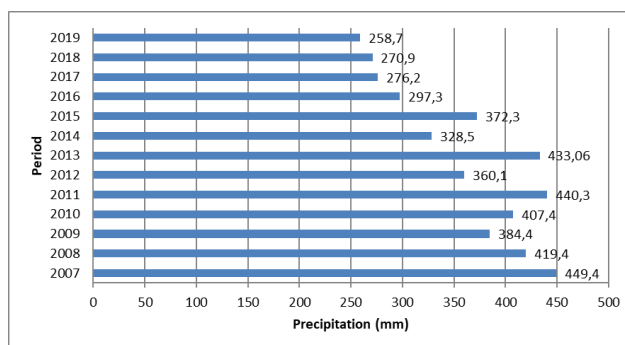


Figure 2. Interannual variation in precipitation (mm)

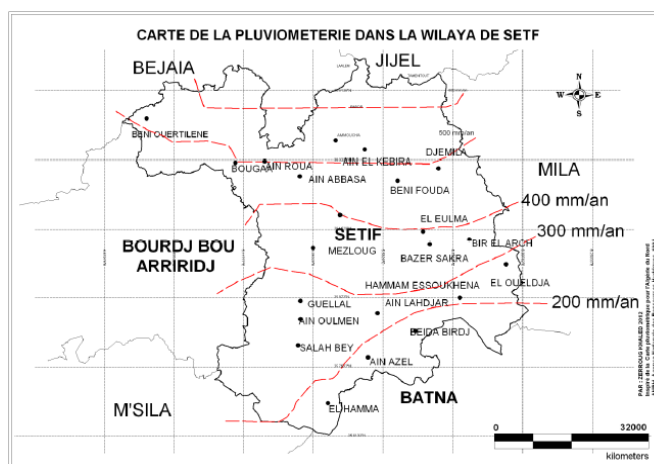


Figure 3. Rainfall map of the wilaya of Setif

The Analysis of the change in average temperatures over 25 years (1985/2010) in the region of Setif, shows that the coldest month is January, while the warmest month is July.

The region is also characterized by the relatively long period of frost (45 days a year) and the winds of sirocco during the summer season (Kefifa et al., 2018).

Ethnobotanical survey

The study was performed between 2020 and 2022. During this period, contacts were established with women (27 interviews) and men (30 interviews) who are practicing herbal medicine, we utilized a non-probabilistic selecting technique called as "non-random sampling by snowball," which involved selecting an informant, in this case, a herbalist and asking them to suggest another informant from the same region (Miara et al., 2019). each person surveyed was subjected to an individual interview using a semi-structured questionnaire previously established (*Table 1*). Based on one of the methods for ethnobotanical data collection, various data (local names, ailments and diseases treated, therapeutic effects, part(s) of plants used, administration methods) were obtained from local healers and traditional medicine men, herbalists, shepherds, patients, and elderly people during field trips. The local people were asked for their consent to share their knowledge only for the purpose of this study. Additionally, the literature on the plants used to treat gastrointestinal disorders supported the obtained data. Information about numerous medicinal plants was gathered through interviews and discussions (Doganu and Uglu, 2013; Buwa-Komoren et al., 2019).

Table 1. A questionnaire used during an ethnobotanical study

Parameter	Information/Questions
Locality of the Medicinal Plants	Collection site: _____ Date: _____
Informants' details	Name: _____ Gender: _____ Age: _____ Occupation: _____ Education: _____ Location/residence: _____
Questions	For how long have you been a traditional healer? Which plants or plant products have you used for medicinal purposes, if any? What ailments do you use? Which part of the plant do you use? How is it used? (dried or fresh) How do you prepare it for use? (tea, infusion, topical application, etc.) Describe in detail how do you prepare for each ailment How is the preparation administered? For how long do you have to take the preparation?

Results and discussion

Information about medicinal plants

57 interviews with users, extractors, and traditional healers of medicinal plants were conducted as part of the study. As shown in *Table 1*, which lists the plants in alphabetical order of their family and botanical names along with the pertinent information, a total of 50 plants from 29 families have been documented for their medicinal use against gastrointestinal problems and as herbal remedies. Traditional medicinal uses of these plants include the treatment of parasite and infectious illnesses such gastroenteritis, peptic ulcers, constipation, bloating, diarrhea, and other GI tract disorders (*Table 2*).

Table 2. List of medicinal plants used for gastrointestinal disorders in Setifian High Plateau, Algeria

Family	Scientific Name	Local name	English name	Plant part(s) used	Medicinal use	Traditional preparation
Rosaceae	<i>Alchemilla vulgaris</i> L.	Rdjel ellassad	Lady's mantle	Leaf	Against diarrhea	Decoction
Amaryllidaceae	<i>Allium sativum</i> L.	Thoum	Garlic	bulbs	Laxative	Chewed
Asteraceae	<i>Anacyclus clavatus</i> (Desf.) Pers.	Baboundj	White buttons	Leaf	Against indigestion, Carminative	Decoction
	<i>Artemisia Herba-alba</i> Asso.	Chih	White wormwood	Leaf	Stomachic, Against gastralgia, to treat gastritis and ulcer	Decoction
	<i>Santolina chamaecyparissus</i> L.	Djaeda	Cotton lavender	Leaf	Against indigestion and gastralgia	Extract
Apiaceae	<i>Apium graveolens</i> L.	Krafs	Celery	Leaf	Carminative	Decoction
	<i>Carum carvi</i> L.	Karouiya	Caraway	Seed	Carminative, Against diarrhea	Decoction
	<i>Coriandrum sativum</i> L.	Kossbor	Coriander	Seed	Against gastralgia, Against diarrhea	Decoction
	<i>Cuminum cyminum</i> L.	Kemoun	Cumin	Seed	Carminative, Against diarrhea	Decoction
	<i>Foeniculum vulgare</i> Mill .	Zeriet elbesbes	Fennel	Seed	Against indigestion and gastralgia	Decoction
	<i>Petroselinum sativum</i> L.	Maadnous	Parsley	Leaf	Laxative	Chewed
	<i>Pimpinella anisum</i> L.	Habet hlawa	Aniseed	Seed	Carminative	Powder
Poaceae	<i>Avena sativa</i> L.	cheir	Common oat	Seed	Against gastralgia	Decoction
	<i>Cynodon dactylon</i> (L.) Pers.	Nedjem	Bermuda grass	Root	Against diarrhea, to treat gastritis and ulcer	Infusion
	<i>Stipa tenacissima</i> L.	Halfa	Alfa grass	Leaf	Treatment of gastrointestinal disorders	Decoction
Fabaceae	<i>Cassia senna</i> L.	Senna meky	Sennas	Leaf	Laxative	Infusion
	<i>Ceretonia siliqua</i> L.	Kharoub	Carob	Fruit	Against diarrhea	Chewed
	<i>Lupinus termis</i> L.	Termes	White lupin	Seed	Laxative	Powder
	<i>Glycyrrhiza glabra</i> L.	Erg essouss	Licorice	Root	Against gastralgia, to treat gastritis and ulcer	Infusion
Iridaceae	<i>Crocus sativus</i> L.	Zaafrane	Saffran	Flower	Against indigestion and gastralgia	Powder
Cupressaceae	<i>Cupressus sempervirens</i> L.	Sarw	Cypress	Leaf	Against diarrhea	Powder

Family	Scientific Name	Local name	English name	Plant part(s) used	Medicinal use	Traditional preparation
Gentianaceae	<i>Erythraea centaurium</i> Pers.	Mararet lehnech	Centaury	Aerial part	Against diarrhea	Powder
Equisetaceae	<i>Equisetum arvense</i> L.	Daneb el khil	Field horsetail	Leaf	Laxative	Decoction
Myrtaceae	<i>Eucalyptus globulus</i> Labill.	Kalitous	Tasmanium blue gum	Leaf	Against diarrhea	Infusion
	<i>Myrtus communis</i> L.	Rayhane	Myrtle	fruit	Treatment of gastrointestinal disorders	Decoction
	<i>Syzygium Aromaticum</i> L.	Rayhen	Clove	Leaf	Against gastralgia, Carminative	Decoction
Moraceae	<i>Ficus carica</i> L.	Tine	Fig	Fruit	Laxative	Chewed
Linaceae	<i>Linum usitatissimum</i> L.	Bedrat keten	Linum	Seed	Laxative	Chewed
Verbanaceae	<i>Lippia citriodora</i> Kunth.	Tey	Verbena	Leaf	Treatment of gastrointestinal disorders	Decoction
Malvaceae	<i>Malva sylvestris</i> L.	khobaiz	High mallow	Aerial part	Against gastralgia, Laxative	Infusion
Lamiaceae	<i>Marrubium vulgare</i> L.	Meriwat	White horehound	Leaf	Against diarrhea, Against nausea	Decoction
	<i>Mentha piperita</i> L.	Nanae	Peppermint	Leaf	Treatment of gastrointestinal disorders	Chewed
	<i>Origanum majorana</i> L.	Bardakouch	Sweet marjoram	Aerial part	Treatment of gastrointestinal disorders	Decoction
	<i>Rosmarinus officinalis</i> L.	Iklil eldjabal	Rosemary	Leaf	Against gastralgia	Decoction
	<i>Origanum glandulosum</i> L.	Zaatar	Garden thyme	Leaf	Against indigestion and gastralgia	Infusion
	<i>Salvia officinalis</i> L.	Miramiya	Sage	Leaf	Against nausea	Decoction
	<i>Teucrium polium</i> L.	Khayata	Felty germander	Aerial part	Against gastralgia	Powder
	<i>Lavandula officinalis</i> L.	Khozema	Lavander	Flower	Carminative	Infusion
Myrtaceae	<i>Myrtus communis</i> L.	Rayhane	Myrtle	fruit	Treatment of gastrointestinal disorders	Decoction
Rununculaceae	<i>Nigella sativa</i> L.	Sinoudje	Black cumin	Seed	Carminative	Powder
Papaveraceae	<i>Papaver rhoeas</i> L.	khochkhach	Common poppy	Flower	Against indigestion	Decoction
Caryophyllaceae	<i>Paronychia argentea</i> lam.	Fetetet lahdjar	Silvery paronychia	Aerial part	Against diarrhea	Decoction
Plantaginaceae	<i>Plantago major</i> L.	Lissan djamel	Common plantain	Leaf	Against gastralgia to treat gastritis and ulcer	Decoction
Punicaceae	<i>Punica granatum</i> L.	Romane	Pomegranate	Fruit	Against gastralgia to treat gastritis and ulcer	Infusion

Family	Scientific Name	Local name	English name	Plant part(s) used	Medicinal use	Traditional preparation
Fagaceae	<i>Quercus silex</i> L.	Baloute	Holly oak	Fruit	Against diarrhea, to treat gastritis and ulcer	Chewed
Rhamnaceae	<i>Rhamnus alaternus</i> L.	Mliles	Buckthorn	Seed	Against gastralgia	Decoction
	<i>Ziziphus lotus</i> (L.) Lam.	Sedra	Jujube	Leaf	Against gastralgia	Decoction
Euphorbiaceae	<i>Ricinus communis</i> L.	Kharouae	Castor	Seed	Against diarrhea	Extract
Rutaceae	<i>Ruta graveolens</i> L.	Fidjl	Rue	Aerial part	Against gastralgia	Decoction
Myrtaceae	<i>Syzygium Aromaticum</i> L.	Rayhen	Clove	Leaf	Against gastralgia, Carminative	Decoction
Urticaceae	<i>Urtica dioica</i> L.	Horaigue	Stinging nettle	Leaf	Against diarrhea	Decoction
Zingiberaceae	<i>Zingiber officinalis</i> Roscoe	Zandjabil	Ginger	Root	Against indigestion	Infusion

The identification of species in the natural environment made it possible to confirm the presence or not of the species mentioned during the ethnobotanic surveys. The identification of the species was carried out, by referring to the new flora of Algeria and the southern desert regions of Quezel and Santa (1962 and 1963).

Medicinal plants and traditional preparation

The majority of medicinal plants determined in this study grow in the wild, while others are cultivated (that is, *Ceratonia siliqua* L. and *Crocus sativus* L.). The family Lamiaceae is represented by the greatest number of species (eight species), according to further research on the families of medicinal plants used against gastrointestinal disorders. Apiaceae are represented by seven species. These are followed by Myrtaceae, Asteraceae, Poaceae and Fabaceae, each represented by three species. The rest are represented by one species each (23 families) (Fig. 4). Examining research done in regions near to our study area, it was discovered that the majority of the medicinal plants utilized in and around the region of Setif were from the Lamiaceae, Apiaceae, and Asteraceae families (Ennabili et al., 2000; Allali et al., 2008; Gonzalez-Tejero et al., 2008; Hadjichambis et al., 2008; Nazim et al., 2020).

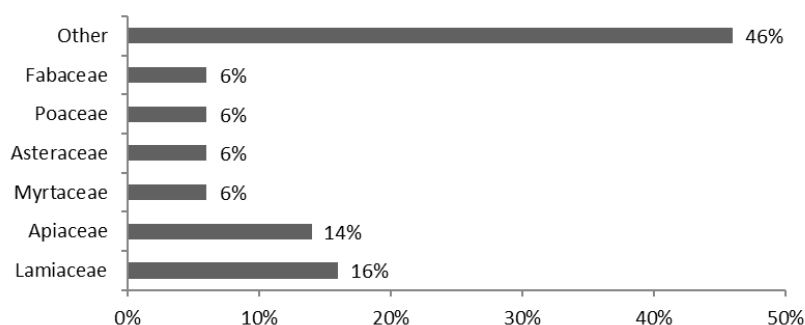


Figure 4. Medicinal plants Percentage in different families, which encompass the most consumption in the region. Other including all other families

The methods of preparation of the medicinal plants were decoction (50%), infusion (18%), powder (14%), chewed (14%) and extract (4%) (Figure 5). Medicinal plants that are consumed directly can be done by eating plant parts or parts of the extract. One type of plant can be utilized in various ways, this results in a total plant of more than 100%. For example, the *Origanum glandulosum* L. can be used directly, that is by taking fresh extracts or by stirring first. Decoction is viewed as a more hygienic and user-friendly way of preparation. Additionally, decoction in water reduces the bitterness level and allows the secondary metabolites in the plants to dissolve (Thomford et al., 2015). Decoction increases the effectiveness of medicinal preparations by allowing the active components to be extracted. Decoction and infusion are the methods mostly used to prepare folk medicine, according to previous research that investigated at nearby areas (Salhi et al., 2010; Sarri et al., 2012, 2014). People still practice the customs of their forefathers. When preparing the treatments, locals commonly include other components including sugar, honey, and oil. Some plants are also used as food-vegetable plants (that is, *Mentha piperita* L. and *Malva sylvestris* L.), appetizer (*Apium graveolens* L.), fruit (that is, *Quercus silex* L. and *Ficus carica* L.) and beverage (*Lippia citriodora kunth.*).

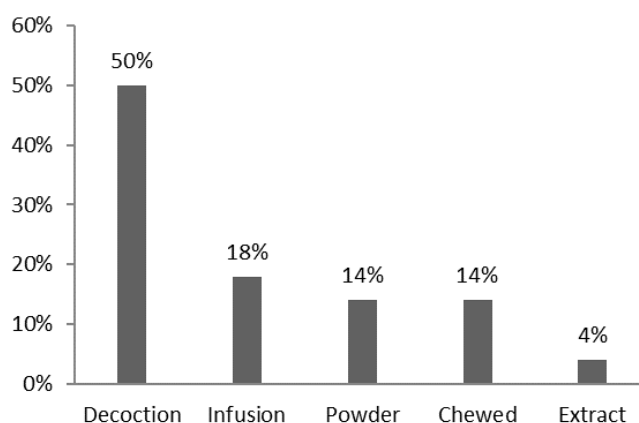


Figure 5. Percentage of traditional methods of preparation of medicinal plant prescribed for the treatment of GI tract diseases and disorders

Plant part and medicinal use

In the traditional treatment of numerous gastrointestinal problems, all parts of different plants are utilized. However, leaves and seeds are the portions that are used the most commonly. All aboveground parts are placed after these parts. The parts used in current study are the roots (3 species), bulbs (2 species), leaves (18 species), flowers (6 species), fruits (6 species), aerial parts (7) and seeds (11 species). Among all parts of a plant, medicinal property is mainly found in the leaves (36%), followed by seeds (22%), aerial parts (14), fruits (12%), roots (6%), flowers 6%) and bulbs (4%). The results of an analysis on medicinal plant parts used to treat gastrointestinal disorders are shown in Figure 6. Similar investigations on plants used as medicines came to the conclusion that the most useful parts of plants are their leaves (Benarba et al., 2015; Benaiche et al., 2019; Nouidjem et al., 2021; Djahafi et al., 2021). These results are in agreement with Chermat and Gharzouli (2015) and Touil et al. (2022) where leaves are found to be the most frequently used parts.

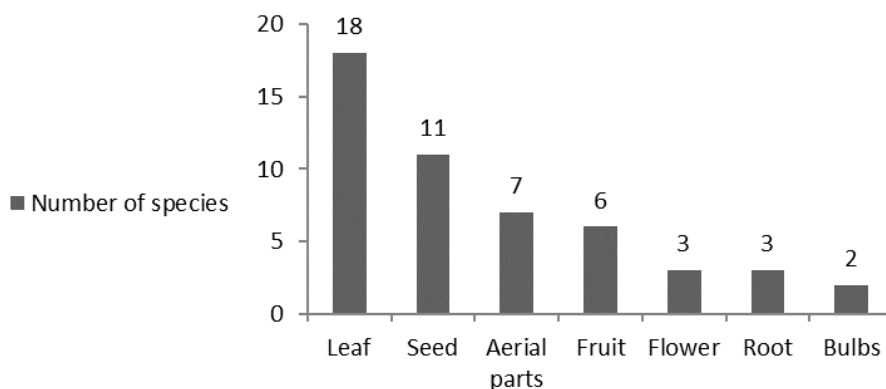


Figure 6. Use frequency (number of species) of different plant parts

At the conclusion of the study, it was discovered that the following gastrointestinal disorders are the ones for which folk medicinal plants are most commonly used: intestinal winds, nausea, gastralgia, indigestion, gastritis, ulcer, and diarrhea (*Figure 7*). The most species (34%) treated gastralgia, followed by diarrhea (26%) and indigestion (14%). Two-thirds of the species (65.96%) were used to treat multiple ailments, compared to 34.04% that were only used to treat one ailment. The present study revealed high number of plant used against gastrointestinal infection in selected regions of Algeria that might be due to the highest prevalence of these infections in studied regions. The presence of a wide variety of medicinal plants and the frequency of gastrointestinal diseases were demonstrated by several ethnomedical research carried out in the studied regions (Meddour and Meddour-Sahar, 2015; Lakhdari et al., 2016; Ouelbani et al., 2016; Miara et al., 2019). The current finding is consistent with research done elsewhere in other regions (Tangjitman et al., 2015; Akash et al., 2015).

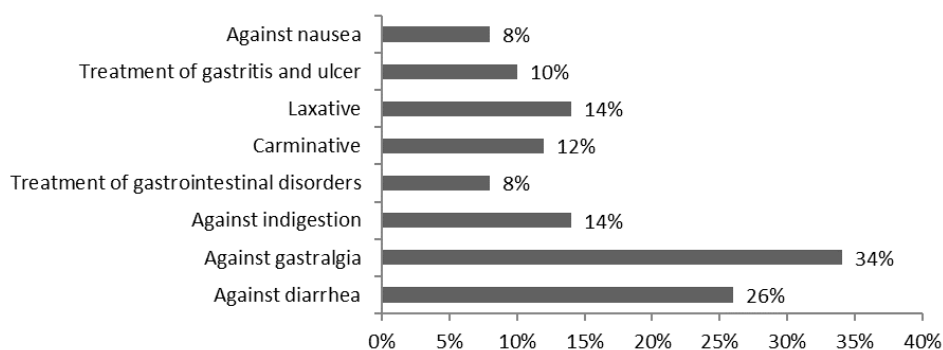


Figure 7. Percentage of medicinal plants used to treat defined GI tract diseases and disorders

Conclusion

Traditional knowledge of medicinal plants and their utilization by indigenous cultures is important for community healthcare and drug development in the present and the future, as well as for the preservation of cultural traditions and biodiversity. 50 plants from 29 families were found to be used by the locals to treat gastrointestinal ailments within the purview of the present study. The majority of medicinal plants determined in this study grow in the wild, while others are cultivated (that is, *Ceratonia siliqua* L. and

Crocus sativus L.). Lamiaceae was the dominant family utilized to treat gastrointestinal problems. Locals use these plants throughout the year by drying, making decoctions from them, or infusing them with other substances. The leaves and seeds of the plants were the parts that were used the most. Also, it was determined that gastrointestinal system ailments for which the folk medicinal plants are mostly used, are as follows: constipation, diarrhea, gastritis and ulcer, intestinal winds, nausea, gastralgia and indigestion. This research showed that plants are actively used in the Setif region of Algeria to treat gastrointestinal problems.

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