Irritable bowel syndrome: ethnobotanical survey of medicinal plants used by the people of eastern Algeria

Síndrome do intestino irritável: estudo etnobotânico das plantas medicinais utilizadas pela população do leste da Argélia

Síndrome del intestino irritable: estudio etnobotánico de las plantas medicinales utilizadas por la población del este de Argelia

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ABSTRACT
This study biodiversity of the use of medicinal plants among the population of eastern Algeria for the treatment of irritable bowel syndrome (IBS), a prevalent gastrointestinal disorder. A total of 210 respondents, primarily women (63%), participated in the survey, revealing a significant inclination towards traditional remedies, particularly among individuals over 40

years old and those with no formal education (70%). The findings indicate that 70% of the participants reported using medicinal plants, with a notable preference for oral administration due to its patient-friendly nature and effectiveness in addressing internal disorders. The research highlights the predominant use of aerial parts of plants, with decoction being the most common preparation method, facilitating the extraction of active compounds. The study also emphasizes the socio-demographic profile of medicinal plant users, noting that married individuals constitute 70% of the respondents, reflecting their role as primary caregivers. The results suggest that the local population's reliance on traditional remedies stems from accumulated knowledge passed down through generations, although there is a concerning decline in this knowledge among younger individuals. The research also revealed the presence of 35 medicinal plants categorized into 21 families, with Apiaceae and Lamiaceae being the predominant ones. This research contributes to the understanding of the cultural significance and therapeutic potential of medicinal plants in Algeria, advocating for further clinical studies to validate their efficacy in treating IBS. By documenting local practices and preferences, this study aims to preserve traditional knowledge and promote the integration of herbal medicine into modern healthcare approaches, ultimately enhancing patient care and treatment options for IBS.

Keywords: traditional remedies, Algerian population, gastrointestinal disorders, foeniculum vulgare, lamiaceae, IBS.

RESUMO

Este estudo sobre a biodiversidade da utilização de plantas medicinais entre a população do leste da Argélia para o tratamento da síndrome do intestino irritável (SII), um distúrbio gastrointestinal prevalente. Um total de 210 inquiridos, principalmente mulheres (63%), participaram no inquérito, revelando uma inclinação significativa para os remédios tradicionais, particularmente entre os indivíduos com mais de 40 anos de idade e aqueles sem educação formal (70%). Os resultados indicam que 70% dos participantes referiram utilizar plantas medicinais, com uma preferência notável pela administração oral devido à sua natureza amigável para o paciente e à sua eficácia no tratamento de doenças internas. A pesquisa destaca o uso predominante de partes aéreas das plantas, sendo a decocção o método de preparo mais comum, facilitando a extração de compostos ativos. O estudo também enfatiza o perfil sócio-demográfico dos usuários de plantas medicinais, observando que os indivíduos casados constituem 70% dos entrevistados, refletindo seu papel como cuidadores primários. Os resultados sugerem que a confiança da população local nos remédios tradicionais deriva do conhecimento acumulado transmitido através de gerações, embora haja um declínio preocupante desse conhecimento entre os indivíduos mais jovens. A pesquisa também revelou a presença de 35 plantas medicinais categorizadas em 21 famílias, sendo Apiaceae e Lamiaceae as predominantes. Esta investigação contribui para a compreensão do significado cultural e do potencial terapêutico das plantas medicinais na Argélia, defendendo a realização de mais estudos clínicos para validar a sua eficácia no tratamento da SII. Ao documentar as práticas e preferências locais, este estudo visa preservar os conhecimentos tradicionais e promover a integração da fitoterapia nas abordagens modernas dos cuidados de saúde, melhorando, em última análise, os cuidados prestados aos doentes e as opções de tratamento da SII.

Palavras-chave: remédios tradicionais, população argelina, distúrbios gastrointestinais, foeniculum vulgare, lamiaceae, SII.

RESUMEN
En este estudio se analiza el uso de plantas medicinales entre la población del este de Argelia para el tratamiento del síndrome del intestino irritable (SII), un trastorno gastrointestinal prevalente. Participaron en la encuesta 210 encuestados, principalmente mujeres (63%), que revelaron una inclinación significativa hacia los remedios tradicionales, sobre todo entre los individuos mayores de 40 años y los que carecían de educación formal (70%). Los resultados indican que el 70% de los participantes declararon utilizar plantas medicinales, con una notable preferencia por la administración oral debido a su facilidad de administración al paciente y a su eficacia para tratar trastornos internos. La investigación destaca el uso predominante de las partes aéreas de las plantas, siendo la decocción el método de preparación más común, lo que facilita la extracción de los compuestos activos. El estudio también hace hincapié en el perfil sociodemográfico de los usuarios de plantas medicinales, señalando que las personas casadas constituyen el 70% de los encuestados, lo que refleja su papel como cuidadores principales. Los resultados sugieren que la confianza de la población local en los remedios tradicionales se deriva del conocimiento acumulado transmitido de generación en generación, aunque se observa un preocupante declive de este conocimiento entre los individuos más jóvenes. La investigación también reveló la presencia de 35 plantas medicinales clasificadas en 21 familias, siendo las predominantes las Apiaceae y las Lamiaceae. Esta investigación contribuye a la comprensión del significado cultural y el potencial terapéutico de las plantas medicinales en Argelia, y aboga por la realización de nuevos estudios clínicos para validar su eficacia en el tratamiento del SII. Al documentar las prácticas y preferencias locales, este estudio pretende preservar los conocimientos tradicionales y promover la integración de la fitoterapia en los enfoques sanitarios modernos, mejorando en última instancia la atención al paciente y las opciones de tratamiento del SII.

Palabras clave: remedios tradicionales, población argelina, trastornos gastrointestinales, foeniculum vulgare, lamiaceae, SII.

1 INTRODUCTION

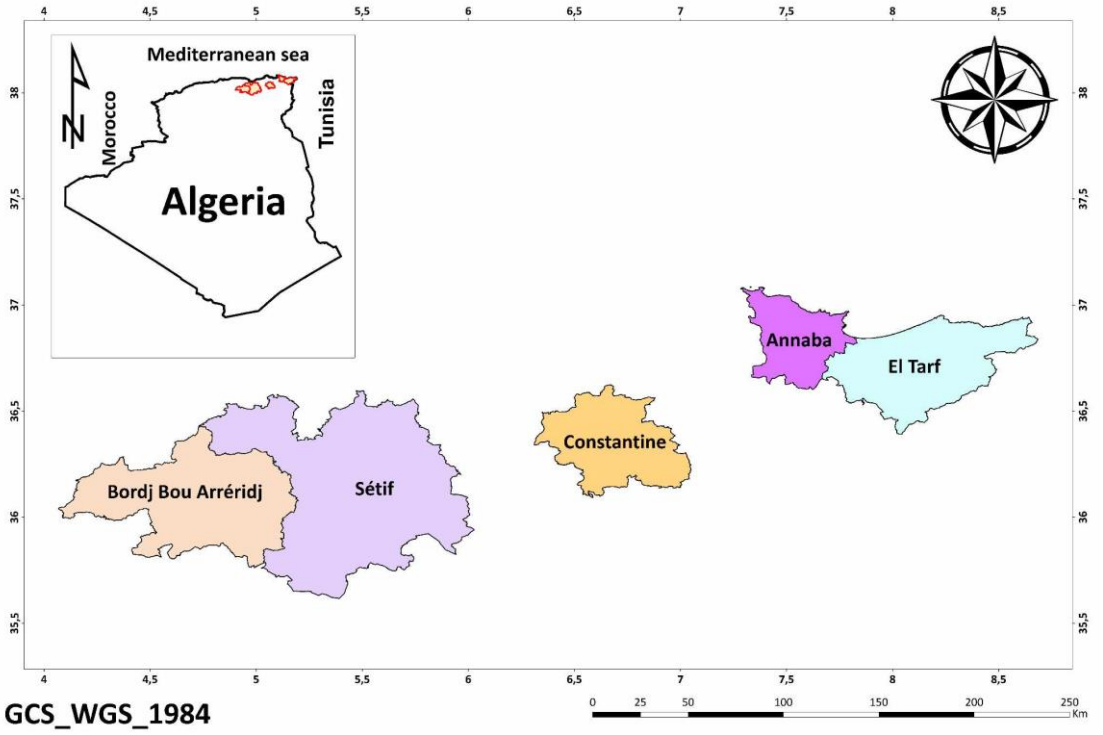
The management and use of biological resources is central to the history of human culture and civilization, and human communities have used resources, especially biological resources, throughout all periods of human evolution (Grass et al., 2021). Indigenous and traditional healthcare systems are particularly prevalent in rural communities around the world (Zhu 2016). At the beginning of the 20th century, the field of ethnobotany experienced a shift from the crude compilation of data to greater methodological efficiency and conceptual reorientation. It also marks the beginning of the academic ethnobotany, which has proven to be one of the most reliable approaches for the discovery of new active ingredients as well as the discovery of new pharmacological properties (Ritter et et al. 2015; Totelin 2016). IBS is a common condition characterized by a complex and multifactorial pathophysiology. This condition involves factors such as visceral hypersensitivity, disturbances in intestinal motility, alterations in intestinal permeability, the detrimental impact of the microbiota, as well as

psychological factors (Ducrotté, 2013). According to the guidelines of the World Gastroenterology Organization, there is no universally applicable treatment for IBS (Quigley et al. 2009). The use of herbal medicines for the treatment of IBS is popular and some clinical trials show a benefit of herbal medicines for symptomatic treatment of this condition. Traditional herbal medicine was well developed in Algeria, but the use of conventional medicine is the cause of a neglect of these ancestral practices that risk falling into oblivion (Rebbas et al. 2012). Algeria has a rich indigenous population who preserve traditional knowledge of medicinal plants used in the treatment of diseases (Hamza et al. 2011; Meddour et al. 2015; Senouci et al. 2019; Bendif et al. 2020; Bouhaous et al. 2022). Studies on several medicinal plants have been carried out in different floristic regions of Algeria (Bendif et al. 2017; Miara et al. 2017). In effect IBS is a functional gastrointestinal disorder of chronic or recurrent symptoms attributed to the intestines, including abdominal pain, disturbed defecation, and/or bloating and distension unexplained by structural or biochemical abnormalities. It is now acquired as a full-fledged disorder of the functioning of the lower part of the digestive system (Hughes 2017). Epidemiologic studies indicate a high prevalence in the general population, ranging from 17% to 22% depending on the diagnostic criteria used to define the condition (Fass and Ofman, 2002; Talley and Spiller 2002). However, a higher prevalence of IBS is found in women than in men (Lee et al. 2001). To establish a complete catalog of medicinal plants and collect information on their therapeutic uses to treat IBS, we conducted a survey among the population residing in the eastern region of Algeria (Annaba, Sétif, Bordj Bou Arreridj, Price, Constantine).

2 ETHNOBOTANICAL SURVEYS AND DATA ANALYSIS

Between February and May 2022, a survey was conducted to identify medicinal plant species of interest, involving herbalists, local residents, grinders, and traditional practitioners. The study area was divided into five strata (Fig. 1) and in each stratum, 60 respondents were sampled, resulting in 300 participants.

Figure 1. Geographical location of the study area



Based on their treatment approach for IBS. The plants being studied were categorized as medicinal based on the criteria set by the World Health Organization (2000). The medicinal plants are whole plants, or parts of plants (leaves, peduncles, buds, flowers, roots, tubers). These plants include single herbs, traditional preparations, mixture of different herbs. For our survey, we took into consideration various population parameters, including distribution of information among users, distribution of informants based on their choice of medicine, sector of user, sex, age, living environment, marital status, education level, distribution of informants according to profession, socio-economic level, social coverage, Frequency of informants' preferences for modern medicine causes and traditional medicine causes. At the same time, we also examined aspects related to the pharmacological analysis of plants, this analysis involved taking into account several factors such as the method of preservation of the plants, the mode of preparation, the specific part of the plant used, the dose administered as well as the duration of the treatment. The results obtained from the surveys are classified according to the use or not of plants for treatment.

3 RESULTS

3.1 USER'S SOCIODEMOGRAPHIC PROFILE

A total of 210 cases were gathered, representing 70% of the respondents who reported using medicinal plants for treating IBS. However, the second category includes individuals who do not use medicinal plants, constituting a group of 90 people, or 30% of the total sample. Refering to the table 1, A clear predominance of women was observed, with 63 % for women compared to 37% for men. The use of medicinal plants in the eastern part of Algeria is widespread across all age groups, but with a more pronounced prevalence among individuals aged over 40, reaching a percentage of 46%. We note that the interest in the use of medicinal plants as an alternative for care is mainly marked by unemployed people, who represent 53%. Regarding the educational level of users, a significant majority, around 70%, had not experienced any formal schooling. According to table 1, it is evident that the use of medicinal plants is significantly higher among married individuals, accounting for 52%. The data displayed clearly indicates a notable disparity in the use of medicinal plants to treat IBS between city dwellers, villagers, and rural individuals. Specifically, the percentage of city dwellers utilizing medicinal plants for this purpose stands at 72%, significantly surpassing the usage rates of villagers (21%) and rural inhabitants (7%). It seems that the respondents showed a clear preference for medicinal plants, citing various reasons for their choice. Specifically, 56% of the informants considered medicinal plants to be effective, while 36% emphasized their cost-effectiveness. Conversely, 8% find pharmaceutical treatment ineffective and more harmful than beneficial. As for modern medical treatments, the majority of respondents (51%) favored these drugs due to their effectiveness. Additionally, 41% of the participants chose these treatments for their accuracy in addressing health issues. However, 8% of the respondents also expressed concerns about the potential toxicity of certain drugs. The survey results indicate that 59% of the respondents reported using medicinal plants, while 41% of them expressed a preference for modern medicine.

Table 1. Classification of patients according to sociographic profile

Factor	Categories	%
Distribution of information among users	Yes	70
	No	30
Sex	Men	37
	Women	63
Age	≤20	8
	[21 -30]	39
	[31-40]	7
	>41	46
Distribution of informants according to profession	Unemployed	53
	Employees	30
	Herbalists	7
	Health professionals	10
Education level	Illiterate	70
	Primary level	18
	Secondary level	8
	University level	4
Marital status	Married	52
	Unmarried	40
	Divorced	2
	Windower	6
living environment	City dwellers	72
	Rural	7
	Villager	21
Frequency of various causes of informants' medication preferences Modern medicine	Effective	51
	More precise	41
	Plant toxicity	8
Distribution of informants based on their choice of medicine	Modern medicine	41
	Traditional medicine	59
Frequency of various causes of informants' medication preferences, Traditional medicine	Effective	56
	Cheaper	36
	Ineffective drugs	8

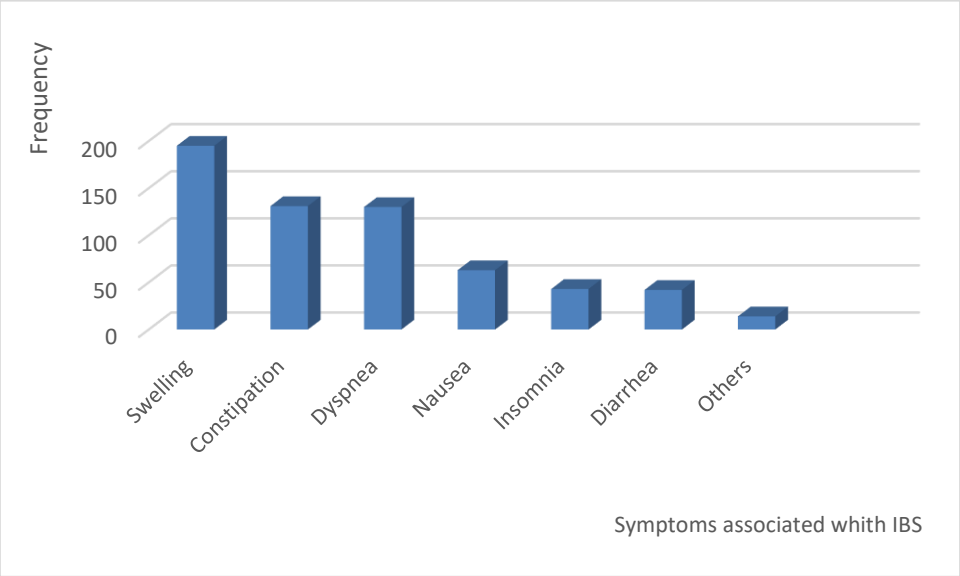
3.2 PHARMACOLOGICAL ANALYSIS

3.2.1 Symptoms associated with irritable bowel syndrome

The fig illustrates the percentage of symptoms associated with irritable bowel syndrome (IBS) and highlights their relative prominence among patients. Swelling is the most frequently reported symptom, accounting for 195 cases, emphasizing its role as a hallmark feature of IBS. Constipation, a characteristic of IBS-C, follows at 131 cases, while, dyspnea, though not traditionally a core symptom, is observed in 130 of cases. Moderately reported symptoms include nausea (63 cases), likely stemming from visceral hypersensitivity or gut-brain axis involvement, and insomnia (43). Less common symptoms include diarrhea (42), characteristic of IBS-D, and "Others" (14), which represent rare or unspecified symptoms possibly linked to

individual variability. The chart underscores the multifaceted nature of IBS, affecting both gastrointestinal and systemic health.

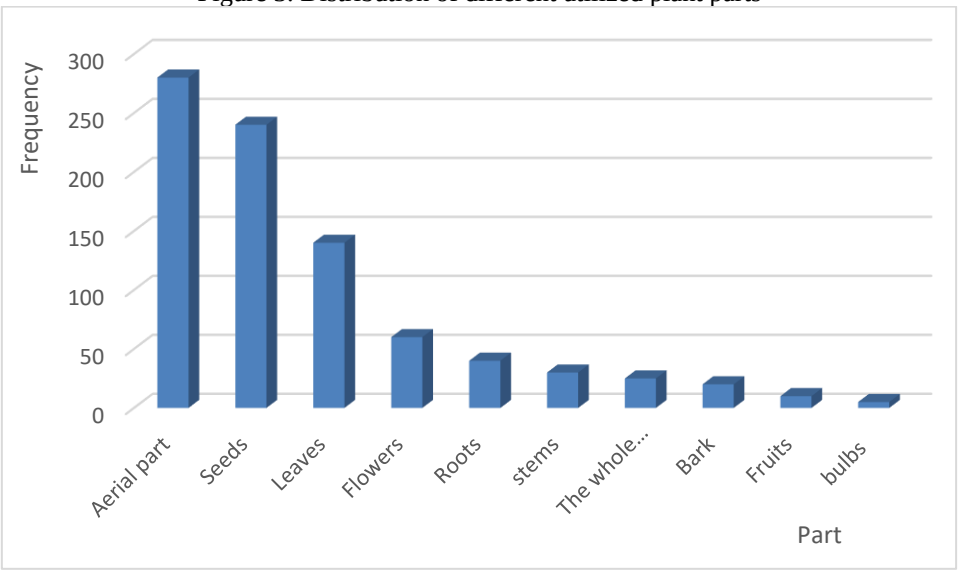
Figure 2. Percentage of most common symptoms experienced during IBS.



3.2.2 Utilization of medicinal plants based on the used part

According to fig. 3, the aerial part of the plant was frequently utilized, reaching a percentage 280 citations followed by the seed, at 240 citations, Leaves come next with 140 citations, and flowers for 60 citations. Then come the other parts with little utilizations like, root and stem.

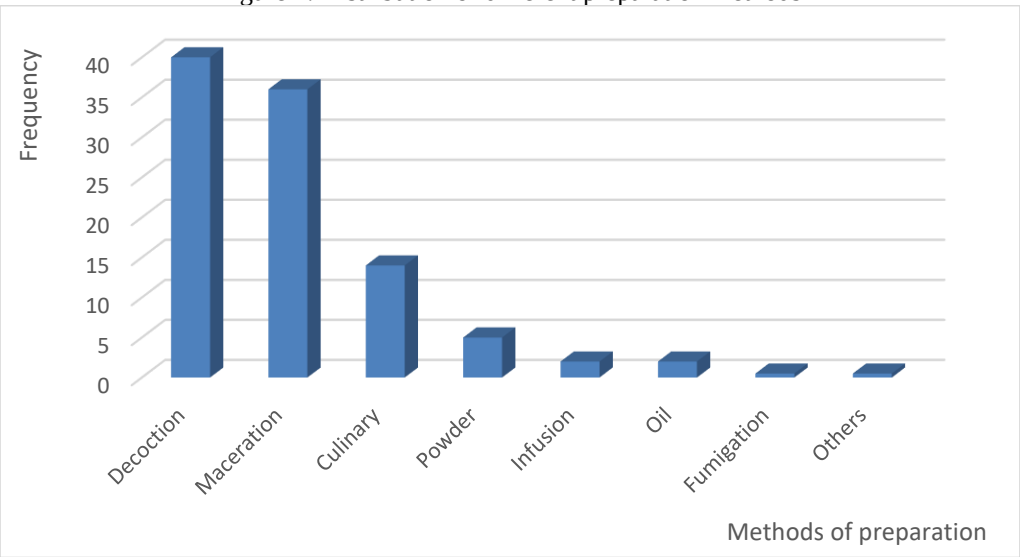
Figure 3. Distribution of different utilized plant parts



3.3.3 Use of medicinal plants according to the methods of uses

To facilitate the administration of the active ingredient, various methods are used, according to fig. 4, we found decoction (frequency=40%), maceration (frequency=36%), cooking at (frequency=14%), powder (frequency=5%), and infusion (frequency=2%). Decoction and maceration are the two most commonly used preparation methods.

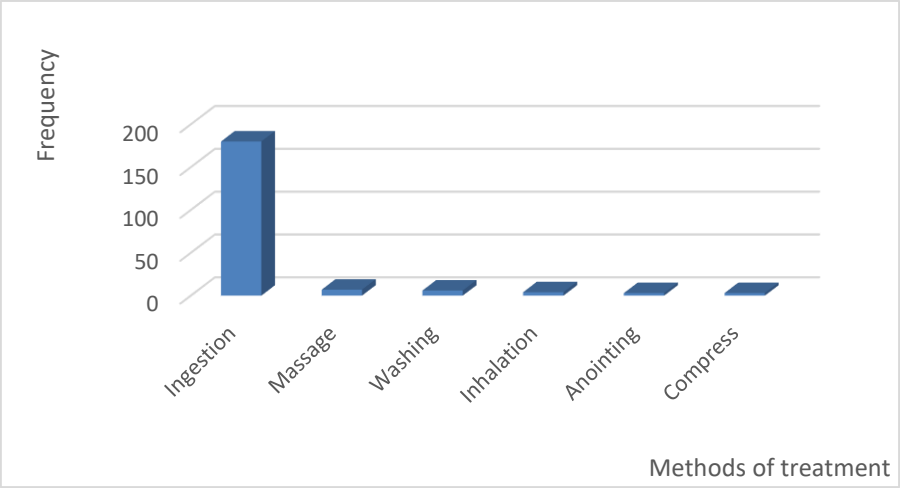
Figure 4. Distribution of different preparation methods



3.3.4 Use of medicinal plants according to the method of treatment

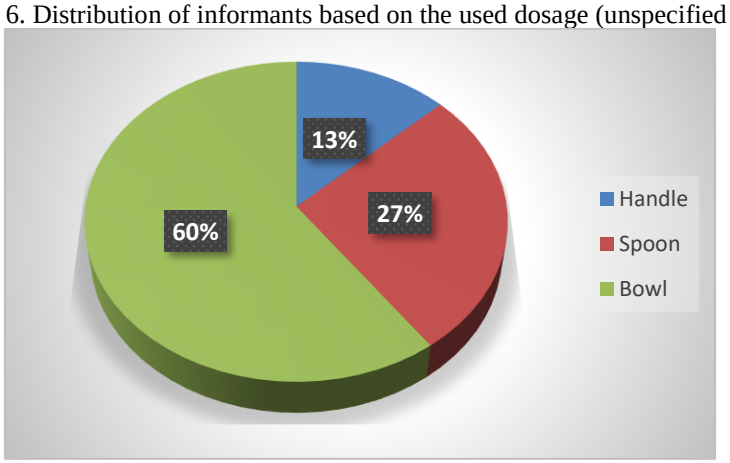
It is noteworthy that the most common method was ingestion (frequency=180 citations), followed by massage (frequency=7 citations), washing (frequency=6 citations) (Fig. 5).

Figure 5. Methods of treatment by medicinal plants



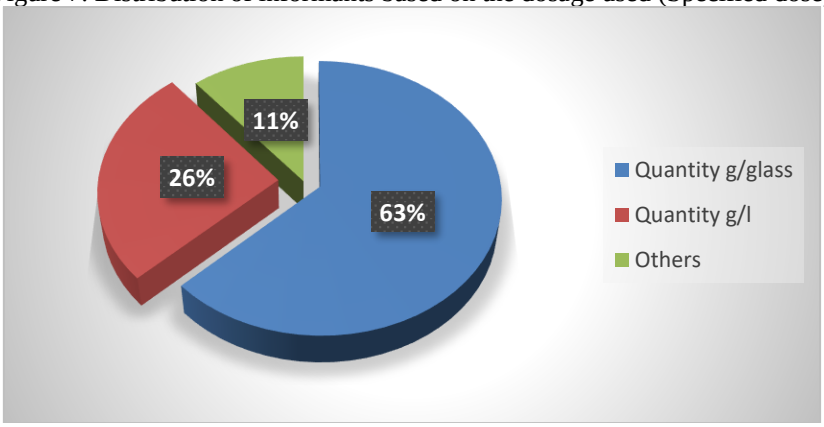
The mentioned medicinal plants are used with unspecified doses, of which 60% are used per bowl, 27% per spoon, 13% per handful (Fig. 6).

Figure 6. Distribution of informants based on the used dosage (unspecified dose)



However, based on the information provided in Fig. 7, it is evident that the reported medicinal plants are used without specific dosage indications. More precisely, among the plants used, approximately 63% are consumed in quantities measured in grams per glass, whereas 26% are used at a rate of one liter per dose. Additionally, a 11% proportion utilizes a different consumption method that is not detailed.

Figure 7. Distribution of informants based on the dosage used (Specified dose)



In the case of children. The data reveals that 69% of instances involve a once-daily consumption, succeeded by 19% opting for a twice-daily regimen, with a smaller portion of 7% choosing to take it thrice daily. Finally, a 5% rate pertains to alternative intake frequencies (Fig. 8). Regarding adults, it's worth noting that a frequency of twice-daily intake stands at 34%, closely followed by a thrice-daily intake at 33%. Around 28% of cases correspond to a once-daily intake. Finally, there is a 5% occurrence of varying intake frequencies (Fig. 9) Referring to the data presented in the fig. 10 for the aged population, it's significant to observe that 38% prefer a daily intake, followed by 35% who choose to consume substances twice a day. Additionally, 23% of the group adhere to a regimen of three times a day. Finally, a 4% proportion represents those who have different patterns of intake.

Figure 8. Distribution of informants according to daily dosage (Child)

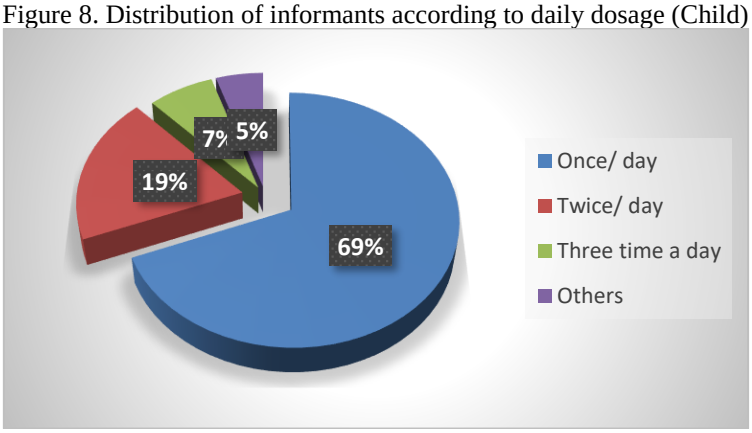


Figure 9. Distribution of informants according to daily dosage (Adult)

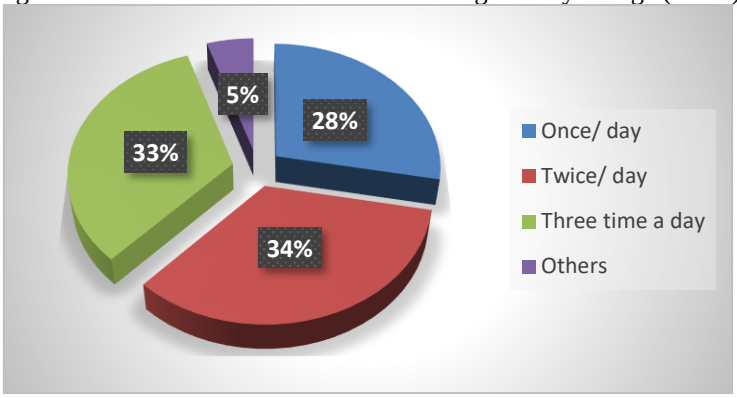
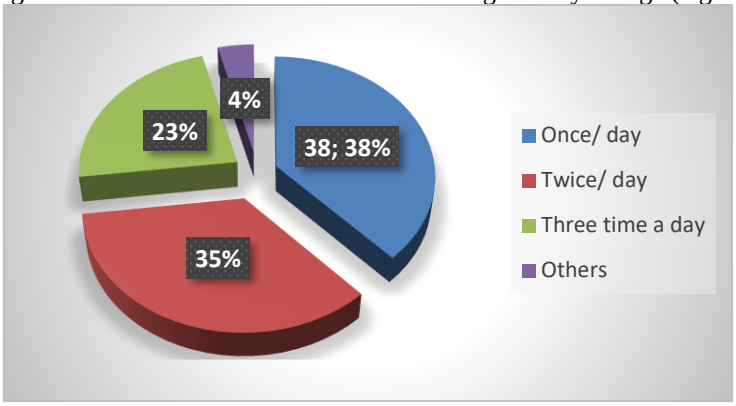


Figure 10. Distribution of informants according to daily dosage (Aged)



According to fig. 11, the duration of treatment varies significantly, up to a year, depending on the individual and the disease being treated, and it is important not to exceed the recommended dose and duration. The analysis has shown that the treatment duration for a complete recovery holds the highest position, accounting for 56% of the total, followed by a one-week duration, representing 20%. Lastly, treatment durations of 1 day, 1 month, and other periods account for 12%, 8%, and 4% respectively. Regarding the method of preserving medicinal plants, the results obtained in (Fig. 12) revealed that plant preservation is primarily carried out in darkness, accounting for 69%. Additionally, 22% of the plants could be preserved through exposure to light, while 9% were associated with alternative preservation methods such as cold storage and freezing, which ensured the preservation of a certain number of plants.

Figure 11. Duration of treatment by medicinals plants

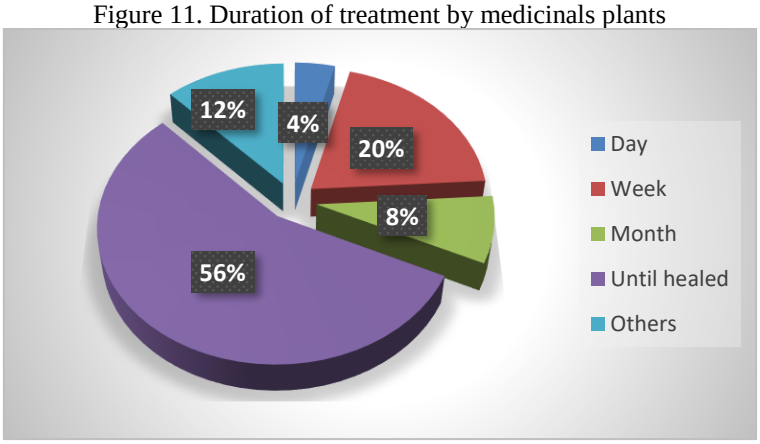
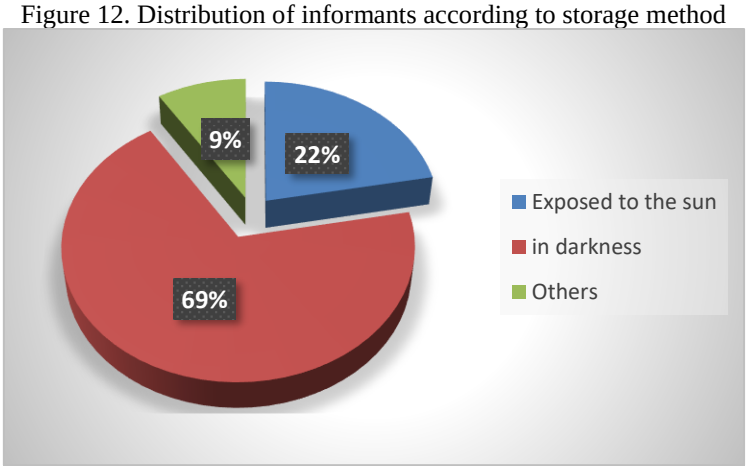


Figure 12. Distribution of informants according to storage method



The current results indicate that self-diagnosis accounts for 49%, followed by ancestral experiential diagnosis at 38% and 13% respectively among the respondents (Fig. 13) From the presented results (Fig. 14), we observe that the most common outcome among patients using medicinal plants is improvement at 75%, followed by a second category stating that these plants have a healing rate of 22%, thus being ineffective and toxic at 2% and 1% respectively.

Figure 13. Proportion of participants responsible for the diagnosis of the disease

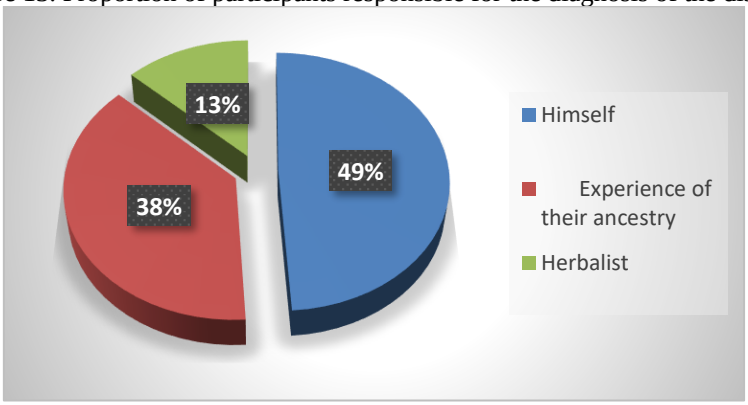
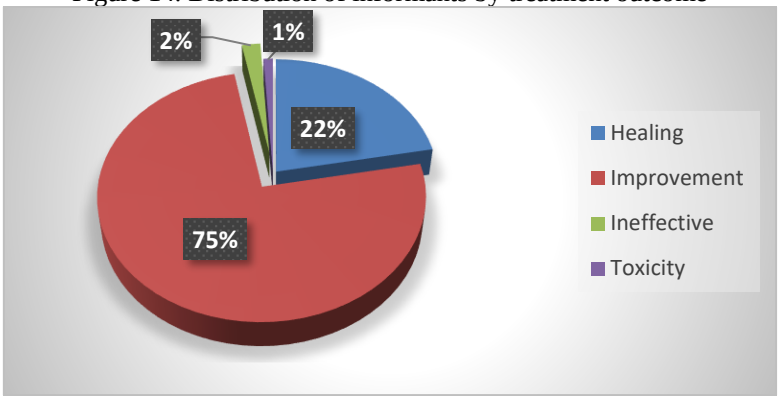


Figure 14. Distribution of informants by treatment outcome



3.4 FLORISTIC ANALYSIS AND SIGNIFICANCE OF SELECTED MEDICINAL PLANTS

The predominant approach for addressing IBS involves the extensive utilization of herbs for treatment. Based on the comprehensive findings, we have compiled a list of the most commonly used plant species in the traditional phytotherapy of the study area (Table 2).

Notably, fennel (Foeniculum vulgare) emerges as the most extensively employed medicinal plant by the local population, followed by rosemary (Rosmarinus officinalis), flax (Linum usitatissimum), peppermint (Mentha piperita), juniper (Juniperus phoenicea), anise (Pimpinella anisum), chamomile (Anthemis citriodora), white sage (Artemisia herba-alba), and cumin (Cuminum cyminum). The limited utilization of less-common medicinal plants among the local population can be attributed to various reasons. Some species are viewed as toxic, resulting in heightened caution within the community. For instance, Plantago ovata seed and Cassia acutifolia exemplify this category. Furthermore, the elevated expense associated with certain medicinal plants can discourage their usage, as observed with Citrus limon. Moreover, certain plants find utility as spices, flavorings, or condiments, as demonstrated by Zingiber officinale and Laurus nobilis.

Table 2. Medicinal plants identified to treat irritable bowel syndrome diseases.

N0	Scientific name	Common name	Family	Part	Preparation
1.	Allium sativum L.	Thom	Liliaceae	Bulb	Decoction
2.	Aloysia citriodora Paláu	Tizana	Verbenaceae	Leaves	Decoction
3.	Anthemis arvensis L.	Baboundj	Lamiaceae	Flowers	Decoction
4.	Artemisia campestris L.	Tgouft	Asteraceae	Whole plant	Decoction
5.	Artemisia herba-alba Asso	Chich	Asteraceae	Leaves, aerial part	Decoction,infusion,powder
6.	Carum carvi L.	karwiya	Apiaceae	Seeds	Infusion
7.	Cassia acutifolia Delile	Sana Maki	Fabaceae	Leaves	Decoction
8.	Cucurbita pepo L.	Yaktine	Cucurbitaceae	Fruits	Decoction
9.	Cuminum cyminum L.	Kamoun akhdher	Apiaceae	Seeds	Decoction
10	Curcuma longa L.	korkom	Zingiberaceae	Roots	Powder
11	Foeniculum vulgare Mill.	Besbes	Apiaceae	Seeds	Decoction
12	Juniperus phoenicea L.	Araàr	Cupressaceae	Aerial part	Decoction,oil

13	Laurus nobilis L.	El rand	Lauraceae	Leaves	Decoction
14	Lavandula stoechas L.	Khouzama	Lamiaceae	Aerial part	Decoction,oil
15	Linum usitatissimum L.	Zaritktan	Linaceae	Seeds	Decoction
16	Illicium verum Hook.f.	Nadjemat el aredh	Schisandraceae	Seeds	Decoction
17	Malva parviflora L.	Khobeiz	Malvaceae	Leaves	Decoction, maceration
18	Mentha × piperita L.	Naànaà	Lamiaceae	Aerial part	Decoction,infusion,oil
19	Nigella sativa L.	Haba el sodas	Ranunculaceae	Seeds	Decoction
20	Ocimum basilicum L.	Ryhanmalaki	Myrtaceae	Aerial part	Infusion
21	Origanum glandulosum Desf.	Zaàter	lamiaceae	Aerial part	Decoction,infusion
22	Pimpinella anisum L.	Yansoun	Apiaceae	Leaves, fruits	Decoction,powder
23	Pinus monophylla Torr. & Frém.	Sanawber	Pinaceae	Leaves	Decoction
24	Plantago lanceolata L.	Lsanel hamel	Plantaginaceae	Leaves	Cooked
25	Plantago ovata Forssk	Syllium	Plantaginaceae	Seeds	Decoction
26	Punica granatum L.	Romane	Punicaceae	Fruits	Powder
27	Raphanus sativus L.	fjel	Brassicaceae	Whole plant	Decoction
28	Ricinus communis L.	Karwa	Euphorbiaceae	Leaves	Extract
29	Rosmarinus officinalis L.	Iklilel djabel	Lamiaceae	Aerial part	Decoction,oil
30	Salvia officinalis L.	Miramia	Lamiaceae	Roots	Decoction
31	Syzygium aromaticum (L.) Merr. & L.M.Perry	Koronfol	Mytraceae	Fruits	Infusion
32	Trigonella foenum-graecum L.	Halba	Fabaceae	Seeds	Decoction
33	Zingiber officinale Roscoe	Zandjabil	Zingiberaceae	Roots	Decoction, Powder
34	Ziziphus lotus (L.) Lam.	Sedra	Rhamnaceae	Leaves	Decoction

The authors of species names were sourced from "The International Plant Names Index (IPNI)" (www.ipni.org). Common Names: The common names were verified using "The Plant List" (www.theplantlist.org) and the "USDA PLANTS Database" (plants.usda.gov).

The fig. 3 shows that the most used parts are the aerial parts of the plant, seeds, flowers, roots, bulbs, fruits can also be employed. In addition, the decoction method is the most used for the majority of species identified to treat IBS. This method ensures the extraction of active ingredients from the hard parts of plants: bark, roots, hard or leathery leaves, stems, fruits, berries, seeds. As for infusion, it‘s used for less hard parts such as species of the genus Mentha, Artemisia, Origanum and Carum. Other forms of utilization are used such as powder, maceration, oils and cooking.

4 DISCUSSION

Women show a higher tendency to use medicinal plants compared to men. Utilizing these plants allows them to avoid and reduce the financial burdens associated with medical practitioners and pharmacies. Over time, accumulated experience has become the primary source of local knowledge regarding the use of plants in traditional medicine. However, there is a decline in this knowledge, particularly among the younger generation, who are increasingly doubting of traditional medicine (Bakri et al., 2022). The intestine is now considered the second brain of the body, influencing overall health (Veyssiere, 2020). The complex pathophysiology

of IBS and the often-disappointing results of conventional medications have led to an increased use of complementary and alternative medicine, particularly medicinal plants, in its treatment. Traditional medicinal plants have long been used for gastrointestinal disorders, including IBS. Some clinical trials suggest that herbal preparations can be beneficial for symptomatic treatment, but more studies are needed to confirm their effectiveness (Rahimi & Abdollahi, 2012). Systematic examination of clinical research is necessary to establish the efficacy of traditional herbal treatments for IBS (Liu et al., 2011). These findings may be explained by the higher prevalence of IBS in females, as supported by research from Atidi (2016), Ekaghba et al. (2020), and Meyiz et al. (2018). Previous studies in Algeria consistently show that Algerian women have a deeper understanding of medicinal plants and their therapeutic uses. This trend is observed in various regions, as reported by Souilah et al. (2018) in the National Park of El Kala (El Taref), Bouziane (2017) in the Azail region (Tlemcen), Bendif et al. (2018) in Bordj Bou Arreridj, Adouane (2016) in the southern Aurès region, and Aribi (2013) in the Jijel region. Similar observations have been made in Morocco by Eddouks et al. (2017) and El Hafian et al. (2014). Previous studies conducted in Algeria yielded results that closely resembled our findings. For instance, Souilah et al. (2018) conducted research in the El Kala region, where they observed a predominance of individuals over the age of 60. Comparing our results with studies conducted outside of Algeria, similar patterns were noted, as seen in Morocco and Egypt (ages 55 and 50, respectively), as reported by Gonzales-Tejero et al. (2008). Overall, the accumulation of experience is associated with age, the transfer of knowledge between individuals, and exposure to information through reading and social networks. Regarding the profession and the education level, our results were similar to other authors in Algeria such as Amrouni (2009) in Serraidi (Annaba), Miara et al. (2017) in Tiaret, Bendif et al. (2018) in El Mansourah and Souilah et al. (2018) in El Kala National Park, which showed that the illiterate represented the high rate of medicinal plant use. The findings derived from Fah et al. (2013) in Cotonou and Abomey-Calavi (Benin), as well as Lahsissene et al. (2009) in the Zaër region (Western Morocco), provide evidence that current folk knowledge is possessed by a limited number of individuals, among whom a notable rate of illiteracy exists (Benlamdini et al. 2014). While in the Jijel region (Algeria), the majority of medicinal plant users are illiterate (52%), as indicated by Aribi (2013). Concerning marital status, our findings align with those in Morocco by El Hafian et al. (2014). The vast majority of medicinal plant users are married, accounting for 70%. This could be attributed to their role as parents, responsible for providing initial care, especially for their children. The local population shows an interest in traditional remedies for everyday ailments and has learned about such treatments through their ancestors, as highlighted

by El Hafian et al. (2014). The high importance of aerial part use can be explained by the ease and speed of harvesting (Bitsindou 1996; Giday et al. 2009), the abundance compared to other parts (Yemele et al. 2015), and ease of conservation (Kadir et al. 2012), but also by its impotence as the site of photosynthesis and sometimes of the storage of secondary metabolites responsible for the properties of plant life (Bigendako-Polygenis & Lejoly 1990). Deeb et al. (2013) have highlighted that the majority of medicinal plants are utilized to treat various illnesses, and the specificity of each treatment depends on the part of the herb used and the preparation method. According to Salhi and Fadli. (2006), the process of decoction facilitates the extraction of a greater concentration of active compounds and diminishes or eliminates the toxic effects of specific preparations. Our results are consistent with those mentioned by Bensalek (2018). The predominance of oral delivery can be linked to a significant occurrence of internal disorders (Polat and Satıl (2012). Moreover, the oral route is favored as the most patient-friendly method. This prevalence of oral administration is consistent with the findings of the majority of ethnobotanical investigations carried out in Africa (Benarba et al. 2014; El Hafian et al. 2014; Chermat and Gharzouli 2015). The best use of a plant would be that which preserves all its properties while allowing the extraction and assimilation of the active ingredients (Dextreit, 1987). About plant preservation, our result corresponds with the discovery of Parfait et al. (2015), where the majority of preparations using different extracts are stored in a light-protected manner, accounting for 90.91%.

5 CONCLUSION

This study underscores the significant role of medicinal plants in the management of irritable bowel syndrome (IBS) among the population of eastern Algeria. The findings reveal a strong preference for traditional remedies, particularly among women and individuals over 40 years old, highlighting the cultural importance of herbal medicine in this region. The identification of 35 medicinal plants from 21 families, with Apiaceae and Lamiaceae being the most prevalent, illustrates the rich biodiversity and traditional knowledge that exists within local communities. The research also emphasizes the need for a deeper understanding of the socio-demographic factors influencing the use of medicinal plants, such as education level, marital status, and living environment. The reliance on these natural remedies reflects not only a quest for effective treatment options but also a response to the limitations and side effects associated with conventional pharmaceutical therapies. Moreover, the study advocates for the preservation of traditional knowledge and practices, which are at risk of being lost in the face

of modernization and changing lifestyles. It is essential to promote awareness and education regarding the therapeutic potential of these plants, ensuring that younger generations appreciate and continue these practices. Future research should focus on the pharmacological validation of the identified medicinal plants, exploring their active compounds and mechanisms of action in treating IBS. By integrating traditional herbal medicine with modern scientific approaches, we can enhance treatment options for IBS and improve patient outcomes. Ultimately, this study serves as a call to action for healthcare professionals, researchers, and policymakers to recognize and support the valuable contributions of traditional medicine in contemporary healthcare systems.

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