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Original Article

Medicinal plants used in Soran district Kurdistan region of Iraq, an ethnobotanicals study

[Plantas medicinales utilizadas en el distrito de Soran, región del Kurdistán de Irak, un estudio etnobotánico]

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Abstract

Context: The current study, the first of its type, focuses on the ethnobotanical uses of 97 medicinal plant species by the inhabitants in the Soran area, Kurdistan region of Iraq.

Aims: To evaluate local knowledge of medicinal plants and provision of preliminary data on the user-benefit of the accessible plant species in the area.

Methods: Between October 2021 and May 2022, key informant interviews were conducted as part of an ethnobotanical survey. Information about a particular study through face-to-face interviews with 171 participants (98 males and 73 females) was collected. For the therapeutic plants considered in the study, quantitative indices such as use value (UV), family use value (FUV), the relative frequency of citation (RFC), fidelity level (FL), and informant consensus factor (ICF) were applied in addition to detailed notes on each plant species.

Results: The survey discovered 97 plant species and 41 plant families. Leaves were the plant portion that was used the most (44%), while seeds were the least (12%). The most popular three methods of preparation were decoction (52%), row (36%), and crushed (6%). The *Olea europaea* species had the highest use values (0.82), while *Vitex agnus-castus* had (0.005). *Amaryllidaceae* had the highest family use value (1.218), while *Asteraceae* had (0.005). According to the consensus index, *Ficus carica* and *Datura stramonium* had (140.84%) and (1.011%). The digestive tract disease category was shown to have the highest informant consensus factor value out of all disease categories (0.57), while the lowest value ICF was (0.0) for tooth pain.

Conclusions: As a result of the development of natural medicines, this study gives information on the indigenous medicinal plants utilized in the Soran district to treat common illnesses that are ready for additional pharmacological and phytochemical examination. For better use of natural resources, the traditional use of plants requires conservation methods and additional research.

Keywords: ethnobotany; food; medicinal plants; Soran district; traditional medicine.

Resumen

Contexto: El presente estudio se centra en los usos etnobotánicos de 97 especies de plantas medicinales por parte de los habitantes de la zona de Soran, en la región del Kurdistán iraquí.

Objetivos: Evaluar el conocimiento local de las plantas medicinales y aportar datos preliminares sobre el uso-beneficio de las especies vegetales accesibles en la zona.

Métodos: Entre octubre de 2021 y mayo de 2022, se realizaron entrevistas a informantes clave como parte de un estudio etnobotánico. Se recogió información sobre un estudio particular a través de entrevistas cara a cara con 171 participantes (98 hombres y 73 mujeres). Para las plantas terapéuticas consideradas en el estudio, se aplicaron índices cuantitativos como el valor de uso (UV), el valor de uso familiar (FUV), la frecuencia relativa de citación (RFC), el nivel de fidelidad (FL) y el factor de consenso del informante (ICF), además de notas detalladas sobre cada especie vegetal.

Resultados: La encuesta descubrió 97 especies de plantas y 41 familias de plantas. Las hojas fueron la parte de la planta que más se utilizó (44%) mientras que las semillas fueron las menos (12%). Los tres métodos de preparación más populares fueron la decocción (52%), crudo (36%) y el triturado (6%). La especie *Olea europaea* tuvo los valores de uso más altos (0,82), mientras que *Vitex agnus-castus* tuvo (0,005). La *Amaryllidaceae* tuvo el mayor valor de uso de la familia (1,218), mientras que la *Asteraceae* tuvo (0,005). Según el índice de consenso, *Ficus carica* y *Datura stramonium* tuvieron (140,84%) y (1,011%). La categoría de enfermedad del tracto digestivo mostró tener el valor más alto del factor de consenso del informante de todas las categorías de enfermedad (0,57), mientras que el valor más bajo del ICF fue (0,0) para el dolor de muelas.

Conclusiones: Como resultado del desarrollo de las medicinas naturales, este estudio ofrece información sobre las plantas medicinales indígenas utilizadas en el distrito de Soran para tratar enfermedades comunes que están listas para un examen farmacológico y fitoquímico adicional. Para un mejor uso de los recursos naturales, el uso tradicional de las plantas requiere métodos de conservación e investigación adicional.

Palabras Clave: alimentación; distrito de Soran; etnobotánica; medicina tradicional; plantas medicinales.

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Abbreviations: COVID-19: Coronavirus disease-2019; KRG: Kurdistan regional government; UV: Use value; FUV: Family use value; RFC: Relative frequency of citation; FL: Fidelity level; CI: Consensus index; ICF: Informant consensus factor.

INTRODUCTION

For 80% of people living in developing countries, herbal medicines are currently the main source of healthcare. Their use has increased dramatically in recent years (Opuni et al., 2021). The phrase "traditional use of herbal medicines" refers to their extensive usage history. The national authorities may permit it because its use is well-established and widely regarded as safe and effective (WHO, 2000). People who want to maintain or improve their health employ herbal therapies. According to general principles from earlier investigations, certain natural substances, for instance, might be useful for the treatment of COVID-19 (Nugraha et al., 2020). About 35,000 to 70,000 plant species are thought to be used for medicinal purposes worldwide; 6,500 of those species are found in Asia (Rajaei and Mohamadi, 2012). Traditional medicine and practices can be broadly divided into three categories; (1) traditional medicine with a systematic codified body of knowledge found in ancient texts scriptures like ancient Mesopotamia, old Babylonian, and old Assyrian periods; (2) non-codified system of traditional medicine or folk medicine, which is transmitted orally and is primarily learned through trial-and-error methods; and (3) spiritual or shamanistic medicine, which has a strong religious and spiritual element (Teall, 2014; Upadhya et al., 2014).

Humans have employed traditional medicine, and knowledge of biodiversity and its application has been particularly significant in Iraq for thousands of years. Medical plants and herbs have been used in Iraq since the Sumerian culture more than 3000 years ago. The usage of various medicinal herbs is described in Sumerian clay tablets, which were then handed on to the Babylonians and Assyrians during a time when medicine flourished, and wealthy Egyptians sought out Babylonian doctors to treat them (Al–Douri, 2014). The non-codified system of traditional medicine is varied and depends on the local flora, culture, and geography. It was created in accordance with the fundamental requirements and locally accessible resources of a certain place (Payyappalimana, 2010). According to categorization, the majority of Kurds are Muslims, and the Prophet Muhammad and the Holy Quran both make reference to a variety of plant species totalling about 70 plants. Popular natural herbal remedies are used for both physical and spiritual healing in addition to the treatment of serious conditions (Tugume et al., 2016). All the aforementioned forms of it are found in Kurdistan. In native tongues, traditional Kurdish herbal medicine is referred to as "GyaDarman". In the Kurdistan area, nature has abundantly produced medicinal herbs. So many different kinds of plants may grow and thrive in mountainous areas. Many Kurdish men and women walk to the hills and mountains in the Soran area during the spring to gather natural plants or herbs next to the Hasan bag, Zozg, Goshen, and Perafate mountains. People report that the number of farmers operating in hilly areas has climbed to 1,600 from 900 last year, conforming to the information from the Soran district agricultural administration many people have taken to planting vegetables in the foothills of HassanBeg mountain in Soran (Muhamad, 2020). Like most communities around the world, people in the Soran area have used plants to make food, farming implements, building materials, and medicinal cures. There is a common misconception that if a location supports medicinal plants, it will also support plants that may cure the ailment (Gunjan et al., 2015).

In contrast to medications made from synthetic materials, phytochemical substances from medicinal plants are widely used for their therapeutic benefits, as well as because they have fewer side effects and are inexpensive and locally accessible. Soran district's residents may be able to raise their standard of living through economic growth and the commercial exploitation of the region's natural resources. In some nations, profits are the main factor driving the marketing and sales of certain plants (Gunjan et al., 2015). Consequently, although there is just a few sporadic ethnobotanical research from Kurdistan that have been published in the scientific literature, medicinal plants still play a significant role in Kurdish society.

Use value (UV) index is one of the quantitative methods that has gained popularity for measuring the relative importance of species (Albuquerque et al., 2006). It is not usually understood that there are numerous ways to assess the UV of plant species or populations that can live in the wild or cultivation (including various degrees of affiliation, toleration, management, and domestication) (Zenderland et al., 2019). By counting a specific type used or the number of people who have said a plant is helpful, the investigation is trying to determine which UV component is more likely to be related (Zenderland et al., 2019). It is vital to identify the species that are most frequently utilized to treat a specific sickness for this aim. The informant consensus factor (ICF) is a helpful tool for locating a certain species (Heinrich et al., 1998). The purpose of this study was to preserve local knowledge of medicinal plants and to provide preliminary data on the user-benefit of the plant species that can be found in the Soran district region. The study's

objectives are to identify and categorize the medicinal plant species that are present in the Soran district region, as well as to gain knowledge about the species through semi-structured face-to-face interviews, in order to evaluate their potential for the creation of novel natural medicines.

MATERIAL AND METHODS

Description of the study area

Iraq, Iran and Turkey form a triangle, and Soran or Diana is situated within that triangle (Fig. 1). About 100 kilometers from the capital of Erbil, in the north-eastern region of the province, is Soran. One of the biggest cities in the Iraqi Kurdistan area is Soran. The Soran district switched to Soran's independent administration in September 2021. Diyana, Mergasur, Khalifan, Rawanduz, and Sidekan are the five sub-districts that make up the Soran district. It is situated on the Hamilton road, which connects Erbil to Haje Omaran and Iran as well as Sulemaniya and Duhok (Rzgar, 2021). The city is situated in a semi-plain area, and the Zozk, Korek, Handren, Hassan Bag, and Bradost mountains, among others, surround it (Erbil Governorate, 2014). The study area is in the municipality of Soran, with coordinates of (36° 42′ 04 N to 36° 37′ 30″ N) in the north and (44° 30′ 01″ E to 44° 34′ 30″ E) in the east, and an average elevation of 700 m above sea level (Hamad, 2020). In Soran, there are three rivers: Balek, the Balekiyan, and the Bekhal. Beautiful natural features may be found throughout Soran, including Jundyan, Bekhal, the waterfall of Geli Ali Beg, and Sakran (Rzgar, 2021). Soran experiences a Mediterranean climate that is cold in the winter (Fig. 2) and hot and dry in the summer. The weather is temperate, and the air is pure, much like in the spring and the fall. Thus, Soran city experiences all four seasons of the year.

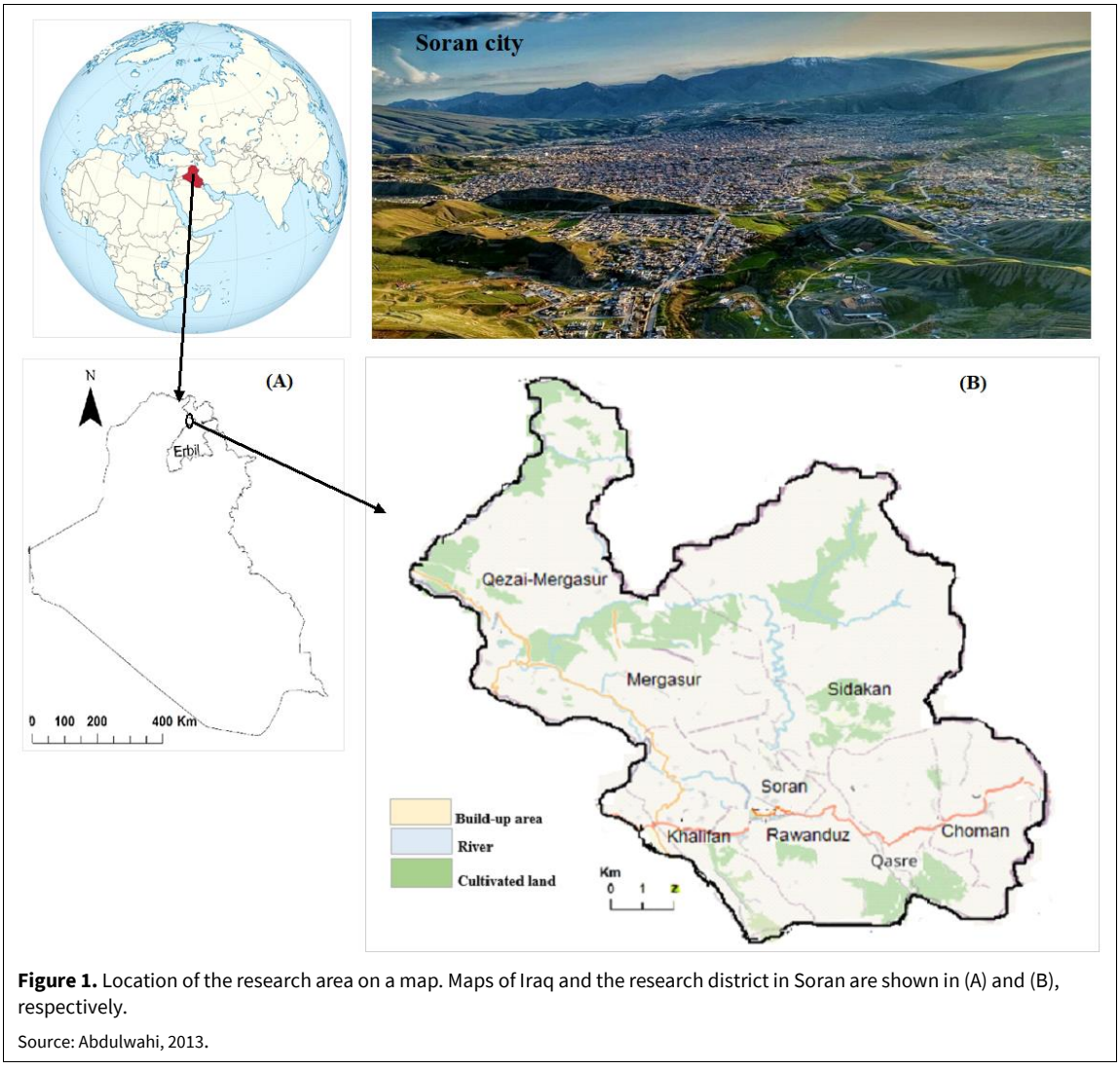

Figure 1. Location of the research area on a map. Maps of Iraq and the research district in Soran are shown in (A) and (B), respectively.

Source: Abdulwahi, 2013.

Figure 2. In the Soran district, winter.
Source: Instagram.

Population

The Soran independent administration has a population of about 350,000 people, or 14.4% of the people in the province of Erbil and covers an area of 5,473 square kilometers. The new administration, which is based in the center of Soran, is typically made up of four districts, 13 towns, and 797 villages (Rzgar, 2021). According to the refuge project, the population of Soran has rapidly grown, with almost 65 percent of its residents being refugees who have returned to Iraq over the past ten years ago. When the Rawandzi and Sadiq districts were destroyed by Saddam Hussein's Iraqi government in 1980, the grew and developed. Kurdish refugees began returning to the Sadiq region of Iran between 1974 and 1989 after the second Iraq-Kurd war and the Anfal Campaign 1986-1988, decades after Saddam's tyranny was overthrown in 1991 (Hamad, 2020). As was previously indicated, the Arabic name Siddeeq district was changed to Soran after the revolt in 1991. Consequently, because of the unusually quick population growth, the Soran district experiences extreme urban pressure growth after 2003. After the Islamic state's (ISIS) recent conquest of the area in 2014, the Sinjar Yazidis, southern Arabs, and Syrian refugees have all been incorporated into the district's population. On September 25, 2017, the Kurdistan region held a referendum on independence, with 93.73 percent of voters in favor. This occurred as a result of a lack of progress toward resolution of the status of these disputed territories between the Kurdistan regional government (KRG) and the Iraqi Federal government. Due to opposition from the Iraqi federal government and international powers, the KRG chose not to pursue independence. On October 16, 2017, the Iraqi army and Shia militias invaded the disputed areas, including the oil-rich city of Kirkuk, and seized control of them (Gunes, 2019). Currently, the Soran district's civil population had placed their hopes on Erbil and Baghdad reaching an agreement over the 2021 budget, which was passed. As part of the Kurdistan region, servants who have not received their salaries in full or on time for nearly seven years, this was a major concern in late March. So, it came as a surprise when KRG announced earlier this week that pay cuts will continue (Wali, 2021). Despite all the political and economic problems, Soran's "hospitality" for newcomers may almost entirely be attributed to the fact that they alienated themselves. According to Bradusty (2017), the Soran health directorate oversees 46 health centers and two hospitals in the region. People today can simply access the contemporary healthcare system. Many people continue to support conventional medicine as well as

alternative and complementary therapies. As a result, traditional medicine plays a crucial and helpful function in the neighborhood, where it is still widely practiced.

Language and religions

The dialects Sorani and Bahdini are equally common in the Soran region. Due to many of the residents of the town having migrated back to Soran from Iran, Persian is frequently spoken together with the two dialects of Kurdish. There are still a small number of people who speak Arabic and Turkish nowadays. Along with Kurdish and Arabic, Syriac is the native tongue of the Assyrians of Hawdiyaan village and Diyana. They also have their own Syriac schools and Christian churches. Muslims and Christians have coexisted peacefully in Kurdistan for a very long time without experiencing any clashes. As religious and ethnic groups are multiplying in the Kurdistan area unlike anyplace else in the Middle East, this culture of acceptance and diversity has become more apparent in the post-Saddam era (Ismail, 2021).

Ethical considerations

Letters of approval (N/225/2021) were acquired from the president of Soran University and the department of general sciences in the Kurdistan Region of Iraq. Participants provided a verbally informed agreement to participate in this study. The study's methodology was created specifically to elicit an invaluable quantity of local knowledge on the use of medicinal plants. All informants provided formal written consent, including consent for publishing, prior to the start of the interviews, and they had the right to withdraw their information at any time. The informants responded favorably to the proposition, and it is clear that they agreed to Fieldwork's request to publish their personal data. Photographic capture, plant collecting, and data documentation were all part of the fieldwork relating to the regional plant resources and the intellectual property rights of the residents.

Interviews with residents in the area

Between October 2021 and May 2022, semi-structured interviews with local residents were conducted as part of this study. In total, 171 people (98 men and 71 women) were questioned in various locations around Soran, including (Diana, Soran, Azadi, Delizia, Sreshma, Khalifan, Bergwan, Rwanduze, Qasre, Badlia). Experts on plants were contacted in order to get nuanced information. The first interview was performed in Kurdish with a group of individuals who were chosen at random (Sorani). Interviews were conducted in public spaces, cafeterias, establishments that cater to specific needs, universities, residences, gardens, and bazaars. Consent and authorization were acquired before providing the following explanation of the study's purpose. Following that, inquiries about the therapeutic properties of plants were made, as seen in Fig. 3. When it was possible, the interview was captured on cassette. A minimum of two visits were made to individuals who knew about plants. The study participants' racial and ethnic backgrounds, the local names of the plant, the serving sizes, and the cooking techniques were all recorded. Participants in the study were asked to provide examples of the wild plants they had used. During the interview with the indigenous people, the International Society of Ethnobiology Code of Ethics was taken into consideration.

Plant materials

Between 2021 and 2022, this investigation was carried out. In the Soran district, 97 plant specimens were gathered during this time period, and it was found that the locals used them as medicines. To identify them, the plants underwent processing. The names of the plant families were listed in alphabetical order. The International Plant Name Index (IPNI: http://www.ipni.org) was used to determine the scientific names for the plant species. On the other hand, there was no local research on therapeutic herbs. Cardboard and an envelope were used to gather some of the plants. It is housed in the biology lab of the Faculty of Education at Soran University and is particularly useful for safe plant components (a reference collection with plant samples on miniature pieces of cardboard had a list of every residential site. It was helpful for people to consider the type of plants and utilize it as a solution since plants fully recognize it. With the assistance of the locals, the native names of the plants were written down and gathered. Using the plant list database at http://www.plantlist.org the scientific names of plant species were confirmed for accuracy in this study. The plant cardboard was used to record the uses of the plants during the interview. The use of the plant cardboard had a significant positive impact on the computations of the utilization value and informant consensus factor. Voucher specimens from the wild that were dried, coded, and then stored in the herbarium at Salahaddin University (ESUH). According to the plant list database, the scientific names of plant species were verified for accuracy in this study (www.plantlist.org).

Figure 3. People in the park of Soran city were interviewed.

Statistical analysis

The information from the interviews was statistically analyzed using Graph Pad Press (2019) and Microsoft Office Excel 2010. The usage value (UV) of each taxon, family use value (FUV), relative frequency citation (RFC), consensus index (CI%), fidelity level (FL), and informant consensus factor (ICF) for each of the medicinal plants in the study were all established using the data provided by the informants in the research area.

Use value (UV)

A quantitative technique that illustrates the relative importance of locally recognized plant species (Trotter and Logan, 1986), the researcher used the formula [1].

$$UV = \frac{\sum Ui}{Ni} \quad [1]$$

Where UV refers to the use value of a species, Ui to the number of citations per specific plant species, and Ni to the number of informants. A high use value indicates the potential importance of the plant species reported.

Family use value (FUV)

The relevance of plant families is determined by the FUV. The FUV values highlight how significant the plant families are. It was determined using a formula [2], followed by Molares and Ladio (2009).

$$FUV = \frac{UV}{N} \quad [2]$$

Where UV= is the total number of respondents reporting the family and N = is the total number of species within each family.

Relative frequency of citation (RFC)

This index determined each species' relative importance locally using the formula below:

$$RFC = \frac{FC}{N} (0 < RFC < 1) \quad [3]$$

Where N= was the total number of informants who took part in the survey, and FC= (also known as the frequency of citation) was the number of informants who reported using the species (Yabrir et al., 2018).

Consensus index (CI %)

According to a consensus index (CI%), which represents the citation by% of informants, the percentage of informants having traditional indigenous

Table 1. The demographics of the survey respondents.

Characteristics of the population	Number of people	Percentage (%)
Gender		
Male	98	57
Female	73	43
Age		
≤20	18	10
21-30	20	12
31-40	31	18
41-50	48	28
51-60	29	17
61-70	20	12
≥71	5	3
Education		
Illiterate	69	40
Elementary	48	28
Secondary	14	8
Tertiary	40	24

knowledge of plant species used for illness control was determined (Sreekeesoon and Mahomoodally, 2014).

$$Cl = \frac{n}{N} \times 100 \quad [4]$$

Where n= is the number of respondents citing herbal species, whereas N= is the number of all informants in the survey.

Fidelity level (FL)

The proportion of respondents who mentioned using particular plant species to treat a particular disease in the study area is known as the fidelity level. The following formula [5] is used to determine the FL index.

$$FL\ (\%) = \frac{Np}{N} \times 100 \quad [5]$$

where Np = refers to the number of informants who independently suggested the use of a species for the same major purposes, and N= total number of informants who mentioned the plant for any use (Friedman et al., 1986). The FL quantified the importance of a species for a given purpose.

Informant consensus factor (ICF)

The formula described was used to calculate the ICF previously as follows (Trotter and Logan, 1986), in order to determine the homogeneity of the data collected from informants and done for each category of disease, ICF was computed using the following formula [6].

$$ICF = \frac{(Nur - Nt)}{(Nur - 1)} \quad [6]$$

Where Nur is the number of usage citations from informants for a certain plant-use category. Nt denotes the total number of taxa or species used by all informants for that particular plant use category and the range of ICF values is 0 to 1, with 0 denoting the lowest level of informant consent and 1 the maximum.

RESULTS AND DISCUSSION

Demographic features of the informants

The demographic details of the respondents were ascertained and recorded through in-person interviews. There were 171 participants in all, with 73 (43%) females and 98 (57%) males (Table 1). Males outnumbered females in terms of numbers, and many shops selling medicinal plants in public places are run by men. However, due to the local rural and community contexts, it was unable to speak with local women (Tounekti et al., 2019). Despite the fact that women in the study area were reluctant to speak up, this is the case (the research team). The majority of women interviewed came from a region where senior citizens objected to having their pictures taken. In contrast, the bulk of experts in the use of medicinal plants are women in several societies in Africa, South America, and Asia (Tounekti et al., 2019). In Table 1, there were informants of various ages: 18 (10%) were 20 years

old or younger, 20 (12%) were 21–30, 31–40, 48 (28%) were 41–50, 29 (17%) were 51–60, 20 (12%) were 61–70, and (5%) were 71 years old or more. These data also show that the majority of those who participated were between the ages of 41 and 50, that those in this age group tend to be more secure and self-assured, that they employ medicinal plants as a kind of therapy, and that rituals and spiritual practices are also incorporated; Among the participants, 69 were illiterate (40%), 48 were in elementary school (28%), 14 were in secondary school (8%), and 40 were in tertiary education (24%). Due to Kurdish Traditional Medicine (KTM), where knowledge of the plants employed is transmitted orally from generation to generation, as opposed to Chinese Traditional Medicine (CTM) and Indian systems of medicine (Ayurveda, Unani, and Sithda), where knowledge is available in books and now online (WHO, 2012). On the other hand, the authors attributed their findings to education levels, contending that the high frequency of illiteracy is caused by Kurdish communities' ongoing engagement in war, conflict, and occupation, which has resulted in a low level of education.

Medicinal plants

In the current study, 97 species of medicinal plants from 81 genera and 41 families were discovered to treat various ailments. Table 2 lists the medical plant species that were employed along with their scientific names, family names, English names, Kurdish names, sections used, administration methods, preparation methods, and medicinal applications in alphabetical-order.

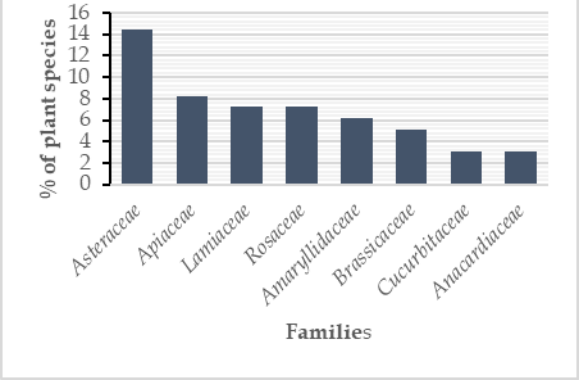

Figure 4. Plant families that are most representative according to the study area.

Fig. 4 findings revealed that it is made up of eight taxonomic families. The *Asteraceae* family has 14 species, making it the largest family in the research region. *Apiaceae* is the second-largest family with 8 species, followed by *Lamiaceae* and *Rosaceae* with 7 species apiece, which are the third-largest families. *Amaryllidaceae* (6 species), *Brassicaceae* (5 species), *Anacardiaceae*, and *Cucurbitaceae* are the families in the fourth tier (3 species each), Only one of the remaining plant families represented one or two species. This is consistent with other studies by Özgen et al. (2012) and Tounekti et al. (2019) which discovered that the Asteraceae family had the highest rate in the Jazan region in Suhdia and the Erzurum district in Turkey. Similar to this, Ahmed (2016) and Hosseini et al. (2022) showed that the *Lamiaceae* was the most well-known family. Among the total number of vascular plants identified, Table 3 indicates the total number of families and species and their percentage of medicinal plants reported during the study period. Table 3 reveals that three species (or 3% of the total) belong to the *Pteridophyte* and ninety-four species (or 97% of the total) to the *Spermatophyte*, which is made up of two gymnosperms and ninety-two angiosperms (12 monocots and 80 dicots). Because they can adapt to a variety of terrestrial settings, angiosperms are more diverse. Since angiosperms have seeds inside of their fruit, they are also known as flowering plants. Similar to this, Abbas and Saeed (2021) founded 65 *Spermatophyta* in total on the Bani Harir mountain (2 Gymnosperms and 63 Angiosperms). Among the total number of vascular plants identified, Table 4 indicates the total number of families and species and their percentage of medicinal plants reported during the study period.

Plant habitat

Herbs (65%) were the first rank most frequently utilized by traditional healers in the Soran district to treat various ills and diseases, according to Fig. 5 proportion of plant habitats. The second rank came in the form of trees (21%), which were followed by shrubs (14%). This discovery is interesting since it supports the findings of Ahmed (2016) and Özgen et al. (2012), who showed that herbs had higher rates than trees and shrubs. These requirements will eventually be connected to the study region and an appropriate environment.

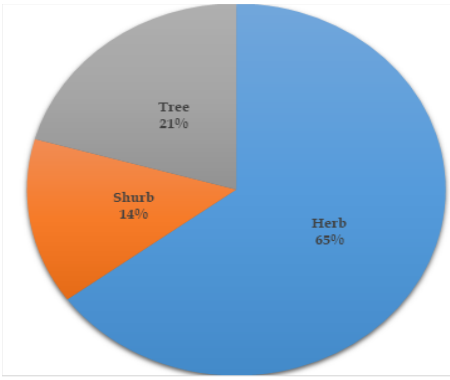

Figure 5. Percentage of the plant habitats.

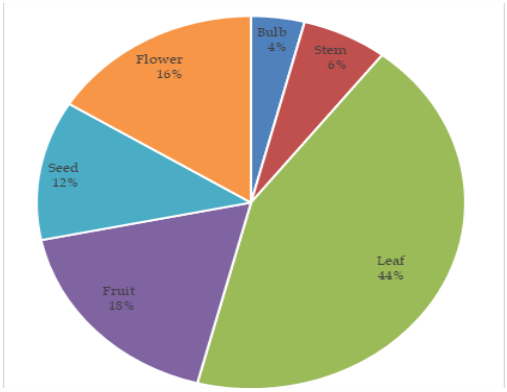

Figure 6. Percentage of parts used.

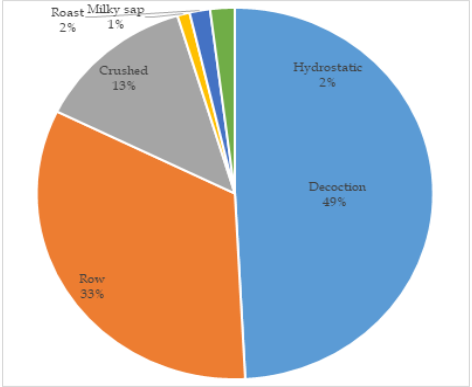

Figure 7. Percentage of preparation.

Plant parts

Many various plant parts, including the leaves, roots, bark, fruit, seeds, and flowers, can be used to extract therapeutic qualities. Different parts of the same plant may contain various active compounds. According to the results in (Fig. 6), leaves account for the biggest percentage of plant components (44%) followed by fruit (18%), flowers (16%), and seeds (12%) in that order. Additionally, less significant plant components including the stem (6%) and bulb (4%) were utilized. According to the authors, there are numerous reasons why leaves are utilized more frequently to cure human diseases. First off, compared to other plant components, the leaves have far higher levels of phenolic, flavonoids, and antioxidant capacity. Second, chop off or remove leaves from the plants to promote faster development and long-term survival. Then, it is simpler to gather the leaves, but you should take care not to break or damage them. The results of this study agreed with those of other studies conducted worldwide (Abe and Ohtani, 2013; Ahmed, 2016).

Plant preparation

The idea of preparing medicinal plants for use in experiments entails the timely and appropriate harvesting of the plant, professional authentication, adequate drying, and grinding. When necessary, the bioactive ingredient is then extracted, fractionated, and isolated. The people who lived in the study region prepared medicine herbs in various ways. Decoction was used the most commonly (49%) following that, as shown in the use of plants in row (33%), crushed (13%), or roasting, and hydrostatic (2%) (Fig. 7). The results of this study concur with those of Ahmed (2016) and Hosseini et al. (2022), who demonstrated that in Sarvabad, Kurdistan Province, Iran, and Sulaimania Province, Iraq, the decoction was the primary method for preparing medicinal herbs.

Diseases treated by plants

With a high rating of usage, this plant suggests that locals in Soran city actively used it. The relative relevance of plant species among practitioners is shown by use values (UV) (Table 2). The highest values of usage were calculated for *Olea europaea* (0.82), *Ficus carica* (0.78), *Punica granatum* (0.77), due to their broad distribution and people' familiarity with their medical applications (Khoja et al., 2022). It has been noted that managed or gardened plants occasionally perform significantly higher in UV than do wild plants (Bussmann et al. 2016). This may be the case because cultivated plants are favoured (or viewed as more helpful) and may be easier to utilize than wild plants, which must be found and identified among related species (Sõukand et al. 2017). Additionally, it's possible that more popular or commonly used plants are more likely to be cultivated or managed than others (Zenderland et al., 2019). Further, social-ecological coadaptation (through domestication processes, landscape modification, and cultural transmission) may lead to an increased or persistent usefulness of plants once in cultivation (Harris 1989). Meanwhile, using the value of wild plants may also be preferred such as *Arum maculatum* (0.55), *Mentha spicata* (0.53), *Gundelia tournefortii* (0.46), *Allium fistulosum* (0.39). In the lack of the time and space commitments required for cultivation, the wild collection provides access to a wide variety of plants, including species that are not suited to culture. Additionally, even for species that are both cultivated and wild-harvested, wild populations may be chosen due to a species' chemistry or cultural values (Zenderland et al., 2019). *Quercus infectoria* (0.51), *Gundelia tournefortii* (0.46), *Ricinus communis* (0.42), *Allium fistulosum* (0.39), *Nasturtium officinale* (0.32), Low use values (UV) for medicinal plants suggest that their knowledge is at risk or that there is reduced availability of that particular medicinal plant.

Allium cepa or onion is typically the most popular remedy if Kurdish people suffer cold, flu, gastrointestinal disorders, or bacterial-associated ailments. According to scientific research, onions strengthen the immune system (Kumar et al., 2010). In the Mediterranean region, the people dried the thick fruit of the Sumac tree (*Rhus coriaria*) and used it as a spice. Several plant chemicals, such as flavonoids, tannins, polyphenolic compounds, and organic acids, are equally abundant in the plant. The plants have antibacterial, antidiabetic, cardioprotective, neuroprotective, and anti-cancer properties. Tests on its toxicity reveal that sumac is safe for use (Alsamri et al., 2021).

Arum maculatum is known as kardi in Kurdish, and it must be cooked in a particular way in order to make it palatable because it is typically deadly if eaten raw. A special method that entails boiling the kardi first, draining it after that, and then adding sumac and hot water. It is well known that Kardi has worm-killing and cleansing properties. Alkaloid, saponin, cyanogenic glycosides, lectins, and terpenes or terpenoids that are active against bacteria, fungus, viruses, and protozoa were found in Kardi, according to Çolak et al. (2009).

Gundelia tournefortii (Kangar) is a Kurdish unique vegetable that grows around mountains, it should be cleaned and removed from the spikes then boiled, fried, and added eggs with onions after that Kurds eat it for lunch or dinner. Both the aerial parts and seeds have antioxidant potential, a favorable chemical makeup, and a polyphenolic content that primarily contains gallic acid and quercetin, making them useful for treating diabetes, diarrhea, and the mumps (Mahmood et al., 2014).

Prosopis glandulosa leaves have strong antifungal, antibacterial, and antiparasitic properties (Rahman et al., 2018). Antioxidant properties in the medicinal plant bean *Prosopis farcta* may be helpful for diabetic individuals (Dashtban et al., 2016).

Lactuca serriola termed also called Taleshka in Kurdish and fed partridge, is used to treat diseases including intestinal, bronchial, and circulatory spasms. Due to the plant's high total phenolic content, which demonstrated effective free radical scavenging capacity similar to quercetin, pharmacological studies indicated its analgesic, anti-inflammatory, and antioxidant effects (Janbaz et al., 2013).

The following families recorded the greatest values according to the family use-value (FUV) index: *Amaryllidaceae* (1.218), *Anacardiaceae* (1.153), *Oleaceae* (0.82), *Lythraceae* (0.77), *Polygonaceae* (0.7), and *Pteridaceae* (0.52). *Brassicaceae*, *Cannabaceae*, *Dipsacaceae*, *Juncaceae*, *Lamiaceae*, *Malvaceae*, and *Solanaceae* all have family used value (0.01) while *Asteraceae* had the lowest used value (0.005) (Table 2). The widespread use of the plant species in the study area may be the cause of the high FUV levels. According to Yabrir et al. (2018), the research area is an extreme ecosystem characterized by its mountain. It has many helpful spontaneous species, as well as some extremely common plants, but there are also some dangerous ones that should be avoided. The majority of these families' members live in the Mediterranean region. For instance, Kurdistan, Iran, Turkey, and Syria have all used *Rhus coriaria*, also referred to as sumac locally to treat a range of diseases. It should be mentioned that in the current study, each dominating family was represented by a single species. This value was used to calculate the user variability of therapeutic herbs, and its effectiveness against various diseases was evaluated. explain the disparities in use by citing socioecological factors (many species in the dominant groups are favored by human activity or farmed for food, medicine, or ornamental purposes) and ecological circumstances -values globally some families have numerous species with wide geographic distributions, because they can grow in quite different ecological conditions, particularly in dry or poor soils (Agelet and Vallès, 2001). This dominance results from the presence of species from these families of several secondary metabolites that are efficient against various illnesses.

Each species' assessed local significance was determined by its proportionate frequency of citation (RFC). The RFC value for medicinal plant usage that promotes health ranged from 0.81% to 0.005% (Table 2). *Ficus carica* (0.81%), *Olea europaea* (0.80), and *Punica granatum* (0.74%) were the most often mentioned species because the traditional medicine practitioners who were surveyed are familiar with them from their frequent use in the treatment of various diseases and the cure for symptoms that resemble them, the local population has previously highlighted these species for their effectiveness in treating a variety of ailments. *Celtis tournefortii*, *Pimpinella anisum*, *Juncus effusus*, and *Datura stramonium* reported the lowest RFC value of 0.005%. These species have the greatest consumption levels that have been observed. These should be put through biochemical, pharmacological, and toxicological testing in order to determine the active principles that will be useful in treating or preventing the condition. Low UV radiation plants shouldn't be ignored in order to promote the transmission of ancestors' knowledge to subsequent generations (Najem et al., 2021).

In Table 2, the consensus indices (CI%) of botanical species were listed in order to assess the informants' consensus on the plants frequently used to treat various ailments. *Ficus carica* (CI% = 140.84%) and *Datura*

stramonium (CI% = 1.01%), which were thought to have higher healing capability in the study area, were used with a great deal of agreement, according to the results.

For evaluating the importance of a species in relation to sickness, the fidelity level (FL), which shows the percentage of respondents who report using a plant species for the same primary purpose, is helpful (Khan et al., 2014). The relative frequency of citations may also be calculated based on fidelity level. In Table 2 the FL for the 97 plant species examined in this study ranged from 100 to 5.88%. The *Vitex agnus-castus* showed the greatest FL of 100% for the menstruation issue, followed by *Ricinus communis* (97.22%), *Mentha spicata* (96.70%), *Adiantum capillus-veneris* (96.66%) for renal discomfort and stomach issue, and *Punica granatum* (96.66%) for indigestion and stomach issue. According to a study Jadid et al. (2020), plants with a high FL content are more frequently exploited as bio-pharmacological resources and should be taken into account for additional conservation efforts, bioassays, and phytopharmacological research. *Mesua ferrea* (5.88%), *Galinsoga parviflora* (11.11%), *Glycyrrhiza glabra* (14.28%), and *Rosa canina* had the lowest levels of loyalty (16.66%).

Limited fidelity levels may also contribute to the region's low plant species diversity. It may also imply that people in Soran City are ignorant of the benefits of this medicinal plant. In order to preserve society's accumulated medical knowledge, even though some plants have low FL, these species shouldn't be eliminated (Jadid et al., 2020). In general, biological activity is more prevalent in plants that are utilized often. A species' increasing FL values attest to its ability to treat a particular sickness, but low FL% plants shouldn't be overlooked because they run the risk of losing their knowledge and might also be crucial for the next generation (Yabrir et al., 2018).

New folk medicinal plants

Since this is the first ethnobotany study conducted in the Soran district, lists 97 therapeutic plants found there. In the current survey, which included these 17 plants, novel plant species properties that had not before been documented in Kurdistan and its surroundings were discovered (Table 5). including the usage of and their therapeutic value and academic study: *Allium ursinum,* which is commonly found growing in forests and adjacent to streams, is a source of polyphenol content and antioxidant activity. It has been used as a spice for thousands of years, and its traditional uses in food and medicine are due to the sulfur-containing compounds alliin and isoalliin (Stanisavljević et al., 2020).

Achillea millefolium yellow contains eight known flavonoids, including artemetin (1), casticin (vitexicarpin) (2), chrysoeriol (3), jaceidin (4), centaureidin (5), apigenin (6), quercettagetin 3,3-dimethyl ether (7), luteolin (8), and 8,8'-bi-3-O-methyl quercetin (Huo et al., 2013). However, against the human breast cancer cell line MCF7WT, compounds 2, 5, and 7 shown antiproliferative action. Additionally, against the PC-3 human prostate cancer cell line, compounds 2 and 5 demonstrated antiproliferative action (Huo et al., 2013).

The primary alkaloids found in *Chelidonium majus* are chelidonine, berberine, coptisine, sanguinarine, and chelerythrine, and they are distributed throughout the plant in various parts (Gañán et al., 2016). This plant is a rich source of various antioxidants and has a variety of therapeutic uses, such as antispasmodic and diuretic properties (Khodabande et al., 2017) Specifically for human pancreatic cancer cell lines, *Chelidonium majus* extracts demonstrated (PC-EM005 and PC-EM002) (Capistrano et al., 2015).

Cephalaria syriaca has shown that seeds can be utilized as an alternative source of raw materials in the production of edible oil and as a source of natural antioxidants and food additives in the cosmetics industry (Kavak and Baştuŕk, 2020).

Silybum marianum contains a variety of distinct substances, the most significant of which are the flavonoids, along with coumarines, phtalides, -pyron derivatives, terpenoids, essential oils, volatile and fatty acids (Czinner et al., 2000). These chemicals are most likely to blame for the crude drug's therapeutic effects (Shaker et al., 2010). Additionally, the flavonoid silibinin function as the primary component of the well-known milk thistle (Czinner et al., 2000).

Mesua ferrea seeds were used to create numerous xanthones, some of which are thought to have biological effects that are thought to be anti-arthritic (Jalalpure et al., 2011). These xanthones could be used to create alternative natural anti-acne formulations (Nakyai et al., 2021).

Plantago major contains ursolic acid and oleanolic acid, which are suitable indicators for anticancer products (Piyaviriyakul et al., 2014). Isomartynoside (1), 10-hydroxymajoroside (2), beta-sitosterol (3), and ursolic acid are four recognized substances (4). Isomartynoside (1), a phenylpropanoid glycoside with antioxidant properties from *Plantago major* subsp., acts as an anticholinesterase (Kolak et al., 2011). Beta-sitosterol, 5-stigmasterol, 7-stigmasterol, avenasterol, and spinasterol are some examples of sterols. Essential oils and plant extracts are of significant interest to the food, cosmetic, and pharmaceutical industries.

Table 2. List of the medicinal plants studied in the Soran district, along with information about them.

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
	Alliaceae										0.29			
1		*Allium porrum* sp. (ESUH 7860)	leek-(Kawar)	Herb	Bulbs, leaves	Decoction, row	Colon	10	51	0.29		10.30	0.06	19.61
	Amaranthaceae										0.185			
2		*Atriplex hortensis* L. (ESUH 7866)	Garden orache (Pekulla)	Herb	Leaves	Decoction	Lung tumor, urinary problems, and enhance vomiting for emergency treatment of poisoning	33	40	0.18		33.23	0.19	82.50
3		*Spinacia oleracea* L. (ESUH 7868)	Spinach (Spinach)	Herb	Leaves	Decoction	Inflammation of lung and colon, glycemia and urinary calculi	20	84	0.01		20.49	0.12	23.81
	Amaryllidaceae										1.21			
4		*Allium haemanthoides* Boiss. & Reut. ex Regel (ESUH 7861)	None (Loosha)	Herb	Leaves	Row	Cardiovascular disease and abdominal pain.	3	10	0.05		3.06	0.02	30.00
5		*Allium cepa* L. (ESUH 7862)	Bulb onion (Piaz)	Herb	Bulb, leaves	Decoction, row	Diuretic, diabetic and reduce arteriosclerosis.	40	81	0.47		40.47	0.23	49.38
6		*Allium ampeloprasum* L. (ESUH 7863)	Wild leek (Qurada)	Herb	Bulb, leaves	Row	Inflammatory symptoms, help the digestion process and reduce cholesterol levels in the blood.	5	14	0.08		5.08	0.03	35.71
7		*Allium fistulosum* L. (ESUH 7864)	Welsh onion (Tara piaz)	Herb	Leaves	Row	Enhancing immune defense and reducing the risk of infection, skin inflammation, snake and scorpion bitten	27	68	0.39		27.40	0.16	39.71
8		*Allium ursinum* L. (ESUH 7865)	Wild garlic (Handrisha)	Herb	Bulb	Row	Cardiovascular, respiratory, and digestive problems, as well as sterilization of wounds	15	33	0.19		15.19	0.09	45.45

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
9		*Narcissus tazetta* L. (ESUH 7867)	Bunch-flowered daffodil (Nirgz)	Herb	Flower	Decoction, smell of flower	Short of breath and emetic, relieve headaches	13	32	0.23		13.19	0.08	40.63
	Anacardiaceae										1.153			
10		*Rhus coriaria* L. (ESUH 7869)	Elm-leaved Sumach (Sumac)	Shrub	Fruit, seed	Decoction	Cholesterol reduction and in gynecology as an abortifacient, antimicrobial and abdominal pain	66	86	0.5		66.50	0.39	76.74
11		*Pistacia eurycarpa* Yalt. (ESUH 7870)	Terebinth (Qezwan or Dareben)	Tree	Fruit, seed	Decoction, row	Stomach pain, skin burning, cough and eczema	75	92	0.53		75.54	0.44	81.52
12		*Pistacia khinjuk* Stocks (ESUH 7871)	Khinjuk (Darbnawsh)	Tree	Fruit	Row	Gastrointestinal pain, toothache, urinary tract, and respiratory tract	54	64	0.37		54.37	0.32	84.38
	Apiaceae										0.01			
13		*Anethum graveolens* L. (ESUH 7872)	Dill (Shuit)	Herb	Leaves	Row, decoction	Gastrointestinal pain, kidney and arthritis pain and hypercholesterolemia	12	17	0.09		12.10	0.07	70.59
14		*Cuminum cyminum* L. (ESUH 7873)	Cumin (Zira)	Herb	Seed	Decoction, crushed	Regulating of the menstrual cycle, promote lactation and carminative	4	6	0.03		4.04	0.02	66.67
15		*Pimpinella anisum* L. (ESUH 7874)	Anise (Yansun)	Herb	Seed	Decoction, crushed	Flu, cough, diuretic, analgesic, indigestion, flatulence, and anxiety	1	3	0.01		1.02	0.01	33.33
16		*Apium graveolens* L. (ESUH 7875)	Celery (Mahdanus)	Herb	Leaves, aerial parts	Decoction	Kidney stones kidney pain, sexual problems, facial massage, and diuretic	5	5	0.02		5.03	0.03	100.00
17		*Coriandrum sativum* L. (ESUH 7876)	Coriander (Gzhnizha)	Herb	Seed, leaves	Decoction, crushed, row	Gastrointestinal problem and urinary tract, diabetes	6	8	0.04		6.05	0.04	75.00

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
18		*Daucus carota* subsp. *sativus* (ESUH 7877)	Carrot (Gizar)	Herb	Roots	Row	Urinary tract problems, Gastric ulcer, bacterial gastroenteritis, diabetes, intestinal worms, and eye problems	10	15	0.08		10.09	0.06	66.67
19		*Foeniculum vulgare* Mill. (ESUH 7878)	Fennel (Razyana)	Herb	Leaves, seed	Row, decoction	Stomach-ache, milk (women) and headache, (menstruation), diarrhea and increasing breast milk	9	12	0.07		9.07	0.05	75.00
20		*Petroselinum crispum* (Mill.) Fuss (ESUH 7879)	Parsely (Karawz)	Herb	Leaves, root	Row, crushed	Anemia and colon problems, powerful diuretic	20	26	0.15		20.15	0.12	76.92
	Araceae										0.55			
21		*Arum maculatum* L. (ESUH 7880)	Cuckoo-pint, lord and ladies (Kardu)	Herb	Leaves	Decoction	Intestinal worms and cancer	90	95	0.55		90.56	0.53	94.74
	Asteraceae (Compositae)										0.005			
22		*Achillea millefolium* L. (ESUH 7881)	Yarrow (Bezhan)	Herb	Flower, aerial parts	Decoction	Wound gastrointestinal disorders, bleeding, wounds, anxiety disorders, skin conditions and inflammation	9	12	0.07		9.07	0.05	75.00
23		*Artemisia dracunculus* L. (ESUH 7882)	Tarragon (Tarkhun)	Herb	Leaves, areal parts	Row, Decoction	Diabetes, digestion problems and shortage of breath	5	8	0.04		5.05	0.03	62.50
24		*Taraxacum officinale* (L.) Weber ex F.H.Wigg. (ESUH 7883)	Dandelion (Chawbaza)	Herb	Flower, all parts	Decoction	Diuretics and cancer	8	15	0.08		8.09	0.05	53.33
25		*Cynara scolymus* var. *scolymus* L. (ESUH 7884)	Globi artichoki (Toi qalghan)	Herb	Leaves, flowers, buds, seed	Row, decoction	Weight loss and diabetes, Kidney stone, gallstone, and gallbladder	5	7	0.04		5.04	0.03	71.43

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
26		*Coreopsis lanceolata* L. (ESUH 7885)	Lance-leaves tickseed (Qazyagha)	Herb	Leaf, flower dry	Decoction	Stomach disease	3	5	0.02		3.03	0.02	60.00
27		*Gundelia tournefortii* L. (ESUH 7886)	Tournefort's gundelia (Kangier)	Herb	Stem, leaves	Decoction, row	Inflammation, diabetes, chest and stomach pain, liver disease and diarrhea	71	80	0.46		71.47	0.42	88.75
28		*Galinsoga parviflora* Cav. (ESUH 7887)	Gallant soldier (Markula)	Herb	Leaf, stem, flower	Row, decoction	Dermatological disorders including eczema, lichen, and non-healing, bleeding wounds	1	9	0.05		1.05	0.01	11.11
29		*Helichrysum arenarium* (L.) Moench (ESUH 7888)	Dwarf everlast (Gea band)	Herb	Leaf	Decoction	Diabetes, diuretic, digestive complaint as a chlorotic	8	21	0.12		8.12	0.05	38.10
30		*Helianthus tuberosus* L. (ESUH 7889)	Jerusalem artichoke (Gura siew)	Herb	Tuber	Row, decoction	Diabetic, diuretic, stomachache, spermatogenetic, stomachic, a folk remedy for diabetes	12	23	0.13		1.13	0.07	52.1
31		*Helianthus annuus* L. (ESUH 7890)	Sunflower (Gulla rwn Gulla barozha)	Shrub	Flower, leaves, seed	Decoction, roast	Lung ailments and malaria, Leaf tea reduces high fevers and has astringent properties, cold and cough	7	28	0.16		7.16	0.04	25.00
32		*Lactuca sativa* L. (ESUH 7891)	Lettuce (Kahw)	Herb	Whole plant, leaves, seed	Milky sap, row, decoction	Hair grows on scar tissue and wound, reduce pain, stomach problems, diabetic, diuretic, an aphrodisiac, anodyne, emollient, febrifuge, narcotic, parasitic and sedative	8	10	0.05		8.06	0.05	80.00
33		*Lactuca serriola* L. (ESUH 7892)	Prickly lettuce (Talishka)	Herb	Stem and leaves	Decoction	Milk women increase and eczema	10	13	0.07		10.08	0.06	76.92

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
34		*Matricaria chamomilla* L. (ESUH 7893)	Chamomile (Gulla hajella)	Herb	Leaves, flower	Decoction	Gastrointestinal problem, hypertension, kidney stone, respiratory, urinary problem, kidney stones, wounds, and irritated skin	24	32	0.18		24.19	0.14	75.00
35		*Silybum marianum* (L.) Gaertn. (ESUH 7894)	Milk thistle (Drka)	Herb	Seed	Crushed	Stomach-ache	2	8	0.05		2.05	0.01	25.00
	Boraginaceae										0.02			
36		*Borago* sp. (ESUH 7895)	Borage (Zmanaga)	Herb	Leaves, flower	Decoction, crushed	Gastrointestinal (diarrhea, colic), respiratory (asthma, bronchitis), cardiovascular and kidney (diuretic), fever, cough, and depression	2	7	0.04		2.04	0.01	28.57
37		*Anchusa azurea* Mill. (ESUH 7896)	Bugloss (Gormza)	Herb	Arial part, leaves	Decoction, row, compress	Diarrhea depurative, diaphoretic, and diuretic, snake bite	3	5	0.02		3.03	0.02	60.00
	Brassicaceae										0.01			
38		*Brassica oleracea* var. *capitata* L. (ESUH 7897)	Cabbage (Kalarm)	Herb	Leaf		Damage cancer prostate	3	8	0.05		3.05	0.02	37.50
39		*Eruca sativa* Mill. (ESUH 7898)	Arugula (Jarjer)	Herb	Leaf		Weight loss, reduced risk of cancer, healthy bones, and improved eyesight	40	45	0.26		40.26	0.23	88.89
40		*Nasturtium officinale* R.Br. (ESUH 7899)	Watercress (Kuzala)	Herb	Stem, leaf	Decoction	Rheumatism, bone diseases, antidiabetic, anti-cardiac disease, to treat kidney disease	23	56	0.32		23.33	0.13	41.07
41		*Raphanus sativus* L (ESUH 7900)	Radish (Tur)	Herb	Root	Row, decoction, crushed	Gastric pain, remove renal stones, constipation problems, kidney stones, chronic trachealis, and hypertension	17	21	0.12		17.12	0.10	80.95

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
42		*Sinapis alba* L. (ESUH7900)	White mustard (Khartala)	Herb	Leaf, flower, seed	Decoction, crushed	Chest congestion, joint pain, sore throat, rheumatic, use as spices	4	9	0.05		4.05	0.02	44.44
	Cannabaceae										0.01			
43		*Celtis tournefortii*-Lam. (ESUH7901)	Hackberry (Tawk)	Tree	Fruit	Row	Diarrhea	1	3	0.01		1.02	0.01	33.33
	Capparaceae										0.12			
44		*Capparis spinosa* L. (ESUH7902)	Caper bush (Gea Margera)	Shrub	Leaves, fruit, flower	Decoction	Gastrointestinal infection, fat liver, diarrhea, gout, rheumatism and cold	8	21	0.12		8.12	0.05	38.10
	Convolvulaceae										0.05			
45		*Convolvulus arvensis* L. (ESUH7903)	Bindweed, or morning glory (Gully lawlawa)	Shrub	Flower	Decoction	Rheumatism	4	10	0.05		4.06	0.02	40.00
	Calophyllaceae										0.19			
46		*Mesua ferrea* L. (ESUH7904)	Ceylon ironwood (Gulla Qasid)	Tree	Seed, flower	Compress, decoction	Itch, scabies and other skin eruptions, dandruff and rheumatism, a decoction of the flowers is drunk by women after childbirth	2	34	0.19		2.20	0.01	5.88
	Cucurbitaceae										0.13			
47		*Citrullus lanatus* (Thunb.) Matsum. & Nakai (ESUH7905)	Watermelon (Shute)	Herb	Seed, fruit	Hydro-distilled, row	Blood pressure, impaction, kidney stones, diuretic, pectoral and tonic, diuretic	20	67	0.39		20.39	0.12	29.85
48		*Cucurbita* L. sp. (ESUH7906)	Cucumber (Zarand or shamamok)	Herb	Fruit	Row	Diabetes and kidney stone	19	43	0.25		19.25	0.11	44.19

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
49		*Cucumis melo* var. *flexuosus* (L.) Naudin (ESUH7907)	Snake cucumber (Trozi)	Herb	Fruit	Row	Stomach pain, diabetes, diarrhea, and intestinal inflammation	28	40	0.23		28.23	0.16	70.00
	Cyperaceae										0.28			
50		*Cyperus scariosus* R.Br. (ESUH7909)	Cypriol (Sotka-Rabnawk)	Herb	Leaf	Decoction	Diabetes, kidney stone, stomach, and bowel disorder	11	48	0.28		11.28	0.06	22.92
	Dipsacaceae										0.01			
51		*Cephalaria syriaca* (L.) Schrad. ex Roem. & Schult (ESUH7908)	Cephalaria (Ziwan)	Herb	Seed	Decoction	Diabetes	1	3	0.01		1.02	0.01	33.33
	Erthroxylaceae										0.31			
52		*Erythroxylum coca* Lam. (ESUH7909)	Coca (Rakyishuk)	Shrub	Leaves	Decoction, row	Enhance stomach function, treating asthma, colds	33	54	0.31		33.32	0.19	61.11
	Euphorbiaceae										0.015			
53		*Euphorbia paralias* L. (ESUH7910)	Sea Spurge (Khuzhelk)	Herb	Leafy spurge,	Decoction, row	Liver disease, breathing disorders including asthma, bronchitis, and chest congestion, skin disease, and constipation	2	6	0.03		2.04	0.01	33.33
54		*Ricinus communis* L. (ESUH7911) L	Ricinus (Garchak)	Shrub	Leave, fruit	Hydrostatic	Skin diseases, colon problems, hair loss, thoracic pain, constipation, and warts	70	72	0.42		70.42	0.41	97.22
	Fabaceae (Leguminosae)										0.14			
55		*Medicago sativa* L. (ESUH7912)	Alfalfa (Wenja)	Herb	Leaf	Row	Osteomalacia	9	26	0.15		9.15	0.05	34.62

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
56		*Prosopis farcta* (Banks & Sol.) J.F.Macbr. (ESUH7913)	Syrian mesquite (Khrnuk)	Shrub	Fruit, seed	Row, crushed	The gastrointestinal problem, stomachache, diabetes, diarrhea, remove of toxic substances, and colon problems	100	128	0.74		100.75	0.58	78.13
57		*Glycyrrhiza glabra* L. (ESUH7916)	Liquorice (Mikuk)	Herb	Roots	Decoction, powder	Gastritis and upper respiratory tract infections	1	7	0.04		1.04	0.01	14.29
	Fagaceae										0.06			
58		*Quercus brantii* Lindl. (ESUH7914)	Oak tree (Dar Baru)	Tree	Fruit	Decoction	General tonic, constipation, Colitis, Severe diarrhea, and hemorrhoid	11	23	0.13		11.13	0.06	47.83
59		*Quercus infectoria* G.Olivier (ESUH7915)	Aleppo oak (Mazu)	Tree	Fruit, flower	Crushed	Mouth and skin wounds, and stomach pain	80	88	0.51		80.51	0.47	90.91
	Juglandaceae										0.09			
60		*Juglans regia* L. (ESUH7916)	Walnut (Guiz)	Tree	Fruit, pods	Row, decoction	Blood cholesterol, immune stimulant, skin problem, mixed with Hannah for coloring hair	11	17	0.09		11.10	0.06	64.71
	Juncaceae										0.01			
61		*Juncus effusus* L. (ESUH7917)	Soft rush (Pezok)	Herb	Leaf, stem,	Decoction	Inflammation, kidney stones, sore throats, jaundice, and edema	1	2	0.01		1.01	0.01	50.00
	Lamiaceae										0.01			
62		*Lavandula angustifolia* Mill. (syn. *L. officinalis Chaix)* (ESUH7918)	Lavender (Lavender)	Herb	Leave, flower	Decoction	Intestinal worm, knee pain, cancer, and insomnia problems	5	13	0.07		5.08	0.03	38.46
63		*Mentha spicata* L. (ESUH7919)	Spearmint (Pung)	Herb	Leaves, flower	Decoction, row, powder	Indigestion, and stomach pain	88	91	0.53		88.53	0.51	96.70

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
64		*Mentha* × *piperita* L. (ESUH7920)	Peppermint (Pung kuwei)	Herb	Leaves, stem, or flower	Decoction, row	Gastrointestinal problem, appetizing, skin sensitivity, and carminative	9	18	0.1		9.11	0.05	50.00
65		*Ocimum basilicum* L. (ESUH77921)	Basil (Rayhan)	Herb	Leaf, stem,	Row	Headache, quit smoking, skin, and cancer	3	7	0.04		3.04	0.02	42.86
66		*Salvia officinalis* L. (ESUH7922)	Sage (Gulla Maryam)	Shrub	Leaf, flower	Decoction	Reduce menopause symptoms, regulate menstrual cycle, hypoglycemic, hypercholesterolemia and fever	8	12	0.07		8.07	0.05	66.67
67		*Thymus vulgaris* L. (ESUH7923)	Garden thyme (Jatra)	Herb	Leaves, seed	Decoction	Stomach treatment, rheumatism, kidney pain, urinary and colon problem, chest pain and improve memory	100	121	0.7		100.71	0.58	82.64
68		*Vitex agnus-castus* L. (ESUH7924)	Chaste tree, Abraham's balm (kaf mrieam)	Shrub	Leaf, flower	Decoction	Menstrual problem, female infertility, and amenorrhea	2	2	0.01		2.01	0.01	100.00
	Lythraceae										0.77			
69		*Punica granatum* L. (ESUH7928)	Pomegranate (Hanar)	Shrub	Fruit	Row	Stomach pain, colon, and hemorrhoid	128	132	0.77		128.77	0.75	96.97
	Malvaceae										0.01			
70		*Althaea officinalis* L. (ESUH7926)	Malvaceae-mallows, mauves (Gulla Hero)	Herb	Flower, seed	Decoction, crushed	Breathing disorders, digestive tract problems, wound healing, diabetic, cough and cold	2	5	0.02		2.03	0.01	40.00
71		*Malva parviflora* L. (ESUH7927)	Cheeseweed (Tolaka)	Herb	Fruit	Row	Abdominal pain, diarrhea, peptic ulcer, and inflammation of the kidney	105	123	0.71		105.72	0.61	85.37

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
	Moraceae										0.39			
72		*Ficus carica* L. (ESUH7928)	Fig (Hanjer)	Tree	Leaves, fruit, milk	Decoction, row	Stomached, diabetes and decrease blood pressure, infertility, hormone balance, wart, piles, and skin disease	140	145	0.78		140.85	0.82	96.55
73		*Morus alba* var. *alba* L. (ESUH7929)	Mulberry (Dar tuo)	Tree	Fruit	Decoction	Anemia, stomached, colon, ovarian cycle, and heart problem	98	110	0.64		98.64	0.57	89.09
	Myrtaceae										0.15			
74		*Syzygium aromaticum* (L.) Merr. & L.M.Perry (ESUH7930)	Clove (Mekhak)	Tree	Seed	Decoction, row	Upset stomach, and toothache relief	19	27	0.15		19.16	0.11	70.37
	Oleaceae										0.82			
75		*Olea europaea* L. (ESUH7931)	Olive (Zaytun)	Tree	Leaf	Decoction	Diabetes	137	141	0.82		137.82	0.80	97.16
	Orchidaceae										0.07			
76		*Orchis mascula* (L.) L. (ESUH7932)	Early purple orchid (Gyalok)	Herb	Root, stem, leaves	Decoction	Irritations of the gastro-intestinal, male sexual disorders, stress and mental disorders, hypertension, and dyslipidemia	5	12	0.07		5.07	0.03	41.67
	Papaveraceae										0.025			
77		*Chelidonium majus* L. (ESUH7933)	Greater celamdine (Mam Meran)	Herb	Leaves	Decoction	Blood pressure and liver disorder	3	10	0.05		3.06	0.02	30.00
78		*Fumaria officinalis* L (ESUH7934)	Fumitory or earth smoke (Shatere)	Herb	Leaves	Decoction	Laxative (constipation) and diuretic, skin problems such as eczema and fat liver disorders	4	11	0.06		4.06	0.02	36.36

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
	Pedaliaceae										0.4			
79		*Sesamum indicum* L. (ESUH7935)	Sesame (Kunje)	Herb	Seed, leaves, seed	Roasted, decoction, hydrostatic	Infant cholera, diarrhea dysentery, catarrh and bladder troubles, strong healthy hair, and increases child growth	50	69	0.4		50.40	0.29	72.46
	Plantaginaceae										0.19			
80		*Plantago major* L. (ESUH7936)	Broadleaf plantain (Rukish)	Herb	Leaves, stem	Decoction, crush	Diarrhea, gastritis, peptic ulcers, irritable bowel syndrome, hemorrhage, bronchitis, catarrh, sinusitis, asthma and hay fever, burns, wounds, inflammation, and snake bites	21	33	0.19		21.19	0.12	63.64
	Polygonaceae										0.175			
81		*Rheum ribes* L. (ESUH7938)	Rhubarb (Rewas)	Herb	Root, stem	Row	Diabetes, appetite, hemorrhoids, ulcers, diarrhea, killing worm, stomach/sedative, and mood enhancer	102	120	0.7		102.70	0.60	85.00
82		*Rumex acetosa* L. (ESUH7938)	Sorrel (Trshoka)	Herb	Leaf	Decoction, row	Inflammation of respiratory system and nasal cavity, heart problem and stomach	19	60	0.35		19.35	0.11	31.67
	Portulacaceae										0.41			
83		*Portulaca oleracea* L. (ESUH7940)	Common purslane (Palpyna)	Herb	Leaf	Decoction	Kidney stones, diabetes, acting as a diuretic, vermifuge, antiseptic and anti-spasmodic	53	71	0.41		53.42	0.31	74.65
	Pteridaceae										0.52			
84		*Adiantum capillus-veneris* L. (ESUH7941)	Southern maidenhair fern (Khara Rasha)	Herb	Root, stem, leaves	Decoction	Kidney pain/antibacterial, anti-obesity and wound healing	87	90	0.52		87.53	0.51	96.67

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
	Rosaceae										0.037			
85		*Crataegus rhipidophylla* Gand. (ESUH7943)	Hawthorns (Gewzh)	Tree	Fruit,	Row,	Prostate cancer	40	45	0.26		40.26	0.23	88.89
86		*Prunus arabica* (Olivier) Meikle (ESUH7944)	Wild almond (Kalashin, or Badamy kewy)	Tree	Seed,	Row	Reflux	13	21	0.12		13.12	0.08	61.90
87		*Prunus dulcis* (Mill.) D.A.Webb (ESUH7945)	Almond; Sweet Almond (Badam)	Tree	Seed	Row, roast, hydrostatic	Hyperlipidemia, and skin problem	31	40	0.23		31.23	0.18	77.50
88		*Prunus microcarpa* C.A. Mey. (ESUH7946)	Blaluk, Halhaluk	Tree	Fruit	Row	Diarrhea	9	21	0.12		9.12	0.05	42.86
89		*Prunus persica* (L.) Batsch (ESUH7947)	Peach (Khokh)	Tree	Fruit, leaves	Row, decoction	Injury stomach, whooping cough, coughs, and bronchitis	11	30	0.17		11.18	0.06	36.67
90		*Rosa* L. sp. (ESUH7948)	Rose (Gulla bakh)	Shrub	Leaves, flower	Decoction	Pain of mouth, constipation, abdominal pain, and nerve disease	60	105	0.61		60.61	0.35	57.14
91		*Rosa canina* L. (ESUH7949)	Dog rose (Shelan)	Shrub	Flower, fruits	Decoction	Diuretic, sedation, and kidney pain	2	12	0.07		2.07	0.01	16.67
	Rutaceae										0.07			
92		*Citrus limon* (L.) Osbeck (ESUH7950)	Limon (Lemo)	Tree	Fruit	Row, decoction	Juice stomachic, and rheumatic conditions	20	25	0.14		20.15	0.12	80.00
93		*Citrus sinensis* (L.) Osbeck (ESUH7951)	Orange (Prtaqal)	Tree	Fruit	Row, decoction	Increase appetite, reduce phlegm; treat coughs and influenza	23	31	0.18		23.18	0.13	74.19

Table 2. List of the medicinal plants studied in the Soran district, along with information about them (continued...)

No.	Family	Scientific name (Voucher species)	English and Kurdish local names	Habit	Plant part used	Preparation	Local medicinal uses/ailments treated	FC	Ui	UV	FUV	CI (%)	RFC (%)	FL (%)
	Salicaceae										0.14			
94		*Salix alba* L. (ESUH7952)	Willow (Dar bi)	Tree	Leaves	Decoction	Painful musculoskeletal joint pain conditions, inflammation, and hyperlipidemic	6	25	0.14		6.15	0.04	24.00
	Solanaceae										0.01			
95		*Datura stramonium* L. (ESUH7953)	Jimsonweed (Afsantyn)	Herb	Leaves, seed	Decoction, crushed	Asthma, ulcer, inflammation, rheumatism and gout, fever, wound and neuroglia	1	2	0.01		1.01	0.01	50.00
	Urticacea										0.03			
96		*Urtica dioica* L. (ESUH7954)	Common nettle (Gazgazka)	Herb	Leaves	Row	Kidney stone	2	6	0.03		2.04	0.01	33.33
	Vitaceae										0.05			
97		*Vitis* L. sp. (ESUH7955)	Wild grapes (Tryei kiwi)	Tree	Fruit, seed	Row, hydrostatic	Anticancer, and hepatoprotective, promote hair growth and prevent ischemic processes hyperlipidemia and cardiovascular disease	3	10	0.05		3.06	0.02	30.00

FC: number of informants related to the use of plant species; Ui: number of different uses mentioned by each informant; UV: use value; FUV: family use value; CI %: Consensus index; RFC: relative frequency of citation; FL: fidelity level. Scientific names were checked according to The Plant List website http://www.theplantlist.org/

Table 3. Plant groups according to their species.

Groups	No. of species	Percentage %
Pteridophyta	3	3
Spermatophyta	94	97
Spermatophyte		
Gymnosperm	2	2
Angiosperm	92	98
Angiosperm		
Monocot	12	13
Dicot	80	87

Table 4. The total number of families and species along with their percentage of therapeutic plants, reported during the study period.

Family	Number of species	Percentage (%)	Family	Number of species	Percentage (%)
Alliaceae	1	1.031	*Juncaceae*	1	1.031
Amaranthaceae	2	2.062	*Lamiaceae*	7	7.216
Amaryllidaceae	6	6.186	*Lythraceae*	1	1.031
Anacardiaceae	3	3.093	*Malvaceae*	2	2.062
Apiaceae	8	8.247	*Moraceae*	2	2.062
Araceae	1	1.031	*Myrtaceae*	1	1.031
Asteraceae (Compositae)	14	14.433	*Oleaceae*	1	1.031
Boraginaceae	2	2.062	*Orchidaceae*	1	1.031
Brassicaceae	5	5.155	*Papaveraceae*	2	2.062
Cannabaceae	1	1.031	*Pedaliaceae*	1	1.031
Capparaceae	1	1.031	*Plantaginaceae*	1	1.031
Convolvulaceae	1	1.031	*Polygonaceae*	2	2.062
Calophyllaceae	1	1.031	*Portulacaceceae*	1	1.031
Cucurbitaceae	3	3.093	*Pteridaceae*	1	1.031
Cyperaceae	1	1.031	*Rosaceae*	7	7.216
Dipsacaceae	1	1.031	*Rutaceae*	2	2.062
Erthroxylaceae	1	1.031	*Salicaceae*	1	1.031
Euphorbiaceae	2	2.062	*Solanaceae*	1	1.031
Fabaceae (Leguminosae)	3	2.093	*Urticaceae*	1	1.031
Fagaceae	2	2.062	*Vitaceae*	1	1.031
Juglandaceae	1	1.031	**TOTAL (41)**	**97**	**100**

The sterols lipid classes of free and acylated sterols and sterol glycosides have been determined as their 9- and 1-anthroylnitrile (El-Mallah et al., 2003).

White mustard (*Sinapis alba*) seed oil is used in cooking, food preservation and body with hair regeneration, biodiesel manufacturing, as a diesel fuel additive, and as an alternative biofuel, according to a review by Mitrović et al. (2020). Additionally, young seedling leaves offer medical benefits for removing poison from the blood in addition to being edible as fresh and delicious salad leaves and being high in vitamins A, C, and E (Rahman et al., 2018). The plant can absorb toxic heavy metals from the soil (Kos et al., 2003).

Table 5. New folk medicinal reports for Kurdistan found in the Soran district.

No.	Scientific name	New folk medicinal plants report	Folk medicinal reports previously recorded in the Kurdish ethnobotany
1	*Allium ursinum* L.	Cardiovascular, respiratory, and digestive problems, as well as for the sterilization of wounds	Against human gastrointestinal cancer cell (Stanisavljević et al., 2020)
2	*Achillea millefolium* L. yellow	Wound gastrointestinal disorders, bleeding, wounds, anxiety disorders, skin conditions and inflammation	Against lung and colon cancer cell lines (Acar, 2021)
3	*Borago sp.*	Gastrointestinal (diarrhea, colic), respiratory (asthma, bronchitis), cardiovascular, kidney (diuretic)	Against human hepatic, prostate, and colon cancer cells (Karimi et al., 2018)
4	*Coreopsis lanceolata* L.	Stomach disease	Anti-inflammatory activity, treat neurodegenerative diseases (Kim et al., 2021)
5	*Chelidonium majus* L.	Blood pressure/ liver disorder	Treat gastric and biliary disorders (hepatitis) (Benninger et al., 1999)
6	*Celtis tournefortii* Lam.	Diarrhea	None
7	*Cephalaria syriaca* (L.) Schrad.	Diabetes	None known
8	*Cyperus scariosus* R.Br.	Diabetes, kidney stone, stomach, and bowel disorder	Anti-diabetes (Alam et al., 2011)
9	*Erythroxylum coca* Lam.	Enhance stomach function, treating asthma, colds	Treat gastrointestinal ailments, motion sickness, and laryngeal fatigue (Weil, 1981)
10	*Galinsoga parviflora* Cav.	Dermatological disorders including eczema, lichen, and non-healing and/or bleeding wounds	Anti-inflammatory activity (Bazylko et al., 2012)
11	*Helichrysum arenarium* (L.) DC.	Diabetes, diuretic, digestive complaint as a choleretic	Anti-atherosclerotic, anti-inflammatory activity (Mao et al., 2017)
12	*Lactuca serriola* L.	Increasing milk from women, eczema	Hepatoprotective activity (Awan et al., 2020)
13	*Mesua ferrea* L.	Itch, scabies and other skin eruptions, dandruff, and rheumatism	Anti-acne (Nakyai et al., 2021)
14	*Orchis mascula* (L.) L.	Irritations of the gastro-intestinal, male sexual disorders, stress and mental disorders, hypertension and dyslipidemia	Treat hypertension and dyslipidemia (Aziz et al., 2009)
15	*Plantago major* L.	Diarrhea, gastritis, peptic ulcers, irritable bowel syndrome, hemorrhage, hemorrhoid, bronchitis, catarrh, sinusitis, asthma, and hay fever	Treat asthma (Anushiravan et al., 2020)
16	*Silybum marianum* (L.) Gaertn.	Stomachache	Anti-hepatitis virus C (Gordon et al., 2006), enhance immunity (Wilasrusmee et al., 2002)
17	*Sinapis alba* L	Chest congestion, joint pain, sore throat, rheumatic, use as spices	Chemoprevention and food preservation (Boscaro et al., 2018)

Scientific names were checked according to The Plant List website http://www.plantlist.org/

Table 6. Percentage of the disease categories and their plant species.

Disease	No. species	Use of citation	ICF
Digestive tract disease, stomach, intestine, colon, constipation, diarrhea	70	163	0.57
Kidney, urinary disorder	35	70	0.54
Diabetic, obesity	22	42	0.48
Respiratory disease	24	45	0.47
The sex hormone, male infertility, female menopause	15	21	0.30
Inflammation, skeletal muscle, rheumatoid arthritis	23	27	0.15
Integumentary problems, skin, hair	29	33	0.12
Cardiovascular disease	25	28	0.11
Tooth pain	4	4	0.00

Informant consensus factor

The reported ailments were categorized into 9 groups based on the information gleaned from the interviews, as indicated in Table 6. The informant consensus factor (ICF) was established to make sure that the information presented was homogeneous. The digestive tract disease category was shown to have the highest ICF value out of all disease categories (0.57). In other words, a high value (close to 1) indicates the availability of plants that the informants frequently use and that can be used to treat digestive tract diseases.

The following species are used as therapeutic herbs in this article: *Allium porrum, Allium haemanthoides, Rhus coriaria, Pistacia eurycarpa, Pistacia khinjuk* stocks, *Anethum graveolens, Coriandrum sativum, Foeniculum vulgare azoricu, Gundelia tournefortii, Helichrysum arenarium, Raphanus sativus, Prosopis farcta, Punica granatum.* Similar to this, Tetik et al. (2013) observed that the highest ICF score for gastrointestinal symptoms was constipation in the Malatya region (0.72). In Sulaymaniyah province, Ahmad (2016) conducted a second study that revealed the digestive tract illnesses had the third-highest ICF value (0.34). On the other hand, in the Jazan region of Saudi Arabia, Tounekti et al. (2019) revealed that disease categories linked to gastrointestinal tract disorders were second placed (ICF = 0.40). Similar to Ethiopia, Brazil, the Peruvian Andes, Bolivia, and Urmia, gastrointestinal ailments were the most prevalent consumption category in numerous other nations and locations (Bahmania et al., 2014). Numerous variables, including stress, exhaustion, smoking, an upset gastrointestinal tract and its motility (ability to keep moving), eating a diet low in fiber, fast food, or not getting enough exercise, can lead to many digestive illnesses (Tangjitman et al., 2015). Above all, the Iraqi-Kurdish War is made up of a string of conflicts and uprisings that the Kurds waged against Iraq's government throughout the 20th century. Environmental elements include financial limitations, family difficulties, and social issues. All of these situations lead to emotional stress, which may affect a number of physiological processes in the gut (GIT). These may include gut motility, mucosal permeability, mucosal blood flow, visceral sensitivity, and mucosal barrier function (Huerta-Franco et al., 2013). This reveals the link between mental health difficulties and the visible symptoms of digestive diseases. Alternatively, digestive diseases could have unknown etiology and natural histories. This demonstrates that problems with the digestive system frequently result in morbidity in people (Tangjitman et al., 2015).

The authors discovered that the kidney and urinary tract disorder category obtained the second-highest ICF value (0.54), the plant species including *Coriandrum sativum, Daucus carota subsp. Sativus, Taraxacum officinale, Petroselinum crispum, Arum maculatum, Cynara scolymusvar. Scolymus* L, *Helichrysum arenarium, Lactuca serriola, Raphanus sativus, Adiantum capillus-veneris, Urtica dioica.* Higher exposure of the men to the contaminants of military warfare during the last three decades of the conflict in Iraq might play an essential role in the elevated kidney problem cases. According to studies, depleted uranium toxicity can harm renal cells, which can lead to kidney cancer (Karwan et al., 2021). There are numerous commonly used plants that have been associated with urothelial cancer and chronic interstitial nephritis.

Diabetes and obesity were placed third (0.48) on the list in the current study, behind the plant species *Artemisia dracunculus*, *Gundelia tournefortii,* and *Cynara scolymusvar. Scolymus* L, *Helichrysum arenarium*, *Orchis mascula, Olea europaea, Prosopis farcta*, and *Rheum ribes*. Similary, Ahmad (2016) found that diabetes is the third-ranked ICF in the province of Sulaymaniyah (0.54). Additionally, in Solhan (Bingöl, Turkey), Polat et al. (2013) discovered that diabetes had the highest ICF value (0.65). The prevalence of diabetes among people increased as a result of evolving lifestyles. The warm weather for a number of months of the year and a lack of necessary infrastructure, such as walking or cycling routes, are considered the main causes of the elevated levels of sedentary behavior in patients (Abuyassin and Laher, 2016).

The next greatest disease groupings were respiratory disorders and sex hormone/male infertility/female menopause, with ICF values of 0.47 and 0.30, respectively. The following plant species have been linked to the treatment of the respiratory tract: *Atriplex hortensis, Spinacia oleracea, Pimpinella anisum, Glycyrrhiza glabra, Althaea officinalis.* Ahmad (2016) reported that respiratory tract disorder had the highest ICF score (0.68) in the province of Sulaymaniyah. There are several ways that dust storms in Erbil city affect people's lives. That has happened recently for a few days or maybe even a week. These dust storms have a significant geographic impact, increase the amount of airborne dust, and have a negative influence on locals' health, particularly respiratory problems. Breath sample Iraq dust causes lung harm in mice via immunosuppression due to decreased regulatory T cell counts and elevated levels of pro-inflammatory cytokines, regardless. Iraqi dust was at least 5 microns in size, hollow and sharp, also traces of titanium were discovered it (Szema et al., 2014).

Plant species include *Lactuca serriola*, *Foeniculum vulgare*, *Salvia officinalis*, *Vitex agnus-castus*, *Ficus carica*, and *Salvia officinalis* are used to treat male infertility and female menopause. Environmental and lifestyle factors that can lead to infertility include lack of a balanced diet, oxidative stress brought on by chemicals used to control pests and unwanted products from industries, tobacco use, excessive alcohol consumption, and exposure to high temperatures to the testes. All of these factors can affect the quality of sperm (Segal and Giudice, 2019). Gonadotropic dysfunction and insulin resistance are the primary pathophysiological elements of polycystic ovarian syndrome (PCOS), and both are frequently linked to high body mass index. Menstrual, ovulation, and infertility issues have been linked to obesity (Khmil et al., 2020).

CONCLUSION

The Soran district has a large range of medicinal plants, and both these and other plant-based medicines are widely used there, according to the findings of the current study. But in mountainous places, a wide variety of plants can grow and prosper. In the spring, a lot of Kurdish people travel to the hills and mountains in the Soran region to collect natural plants known as (GyaBahar) or herbs next to the Hasan bag and Zozg mountains. These plants include *Gundelia tournefortii* (kangir), *Rheum ribes* (rewas), and *Arum maculatum* (kardu), among others. They then sell natural herbs. Whatever the reason, users of herbal remedies should have faith that the goods they purchase are secure and contain what they claim to, whether that is a particular herb or a predetermined amount of a particular herbal component.

Depending on the species, the same plant may have distinct names in different nations, or the opposite. The variety of plant names makes it difficult to know which plant to use. It is crucial to maintain track of regional names in order to identify the correct plant. Local names have a significant role in our cultural past. Kurds have a unique language, set of traditions, and way of life. The younger Kurdish generation's lack of interest in learning and preserving ancient medical knowledge is another problem. However, in a Middle Eastern location that has recently struggled, medicinal plants might be able to aid the residents.

With the help of this ethnobotanical study, 97 species from 41 families. There were 14 *Asteraceae*, 8 *Apiaceae*, 7 *Rosaceae* and *Lamiaceae*, 6 *Amaryllidaceae*, 5 *Brassicaceae*, and 2 other major families (3 *Anacardiaceae* and *Cucurbitaceae*) are identified. For the treatment of various ailments, seventeen plant species were discovered for the first time in the study area. UV, FUV, RFC, and FL provided examples of the research area's most popular and widely used plants. *Ficus carica*, *Olea europaea* (0.80%), and *Punica granatum* (0.74%) had the greatest RFC and Cl%. Given the high ICF values of these plants, it is thought that the Soran district has the most effective plants for treating digestive system diseases. This shows that gastrointestinal problems frequently cause sickness in people, regardless of dietary habits or psychological conditions. Additional research on these plants may provide important information for the development of new drugs to treat digestive system disorders.

Even though some therapeutic plants have been reported to have high UV and FL values, further pharmacological research is still required to identify novel compounds and comprehend the biological processes of these plants. Some of these plants have been linked to some negative impacts, it was found. Herbal remedies should be used carefully in order to reduce any potential side effects that may occur from using these therapeutic plants. Herbs can be dangerous if taken extensively, thus regulation is necessary. Future includes using nanotechnology and purified bioactive compounds for administration. The government must adopt a strategy to better promote the industry and preserve the species of medicinal plants and the practitioners' knowledge because it is the basis for modern drug research breakthroughs.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTION:

Contribution	Abdulwahid-Kurdi SJ	Abdulwahid MJ	Magaji U	Aghwan ZA	Atan R	Hamadamin KA
Concepts or ideas	x					
Design	x					
Definition of intellectual content	x					
Literature search	x					
Experimental studies	x					
Data acquisition	x	x				
Data analysis	x	x				x
Statistical analysis	x	x	x	x		x
Manuscript preparation	x	x	x	x		x
Manuscript editing	x	x	x	x	x	x
Manuscript review	x	x	x	x	x	x

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