



MEDICINALLY WILD EDIBLE VEGETABLES AND FRUITS OF KURDISTAN REGION OF IRAQ

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ABSTRACT

As medicine, wild edible plants have a significant socioeconomic impact. The connection between food and health is historical, as customers increasingly want healthy, flavourful, and natural functional foods. Knowledge of such foods is primarily transferred through the contributions of household members. Because the traditions of using wild edible plants as food and medicine are at risk of extinction around the world. In this study, snowball sampling was adopted. Thirty-seven (37) wild edible plant species from 17 families, with Fabaceae (18.9%) being the most dominant one, followed by Apiaceae (16.2%), Anacardiaceae, Moraceae and Malvaceae 8.1%, respectively, mostly used for a range of medicinal purposes. Leaves and fruits accounted for 26.42%, respectively. Majority of the respondents in this survey were from age 41 to 50 (38.2%). There is a considerable variety of wild vegetables and fruits that are used medicinally, and there is also well-maintained community knowledge about how to use wild fruits and veggies plants for people of all ages. The results of this investigation will also provide locals with a useful starting point for choosing significant wild foods for medicinal uses.

Keywords: Ethno-medicinal plants, fruits, traditional knowledge, vegetables

INTRODUCTION

More than 700 million people globally are malnourished (Dejene *et al.*, 2020). In some situations, nutritional deficiencies are caused by the lack of dietary diversity and insufficient micronutrient intake (Dejene *et al.*, 2020). In this setting, wild forest foods play essential role as dietary supplements, by increasing the dietary diversity of rural populations in poor nations (Powell *et al.*, 2015; Satpute *et al.*, 2021). To solve this problem and keep the natural world in harmony, people in a community rely on "local wisdom," which encompasses of the collective knowledge, beliefs, understanding, insights, customs, values, and social norms of a particular group. As such, local knowledge serves as a resource for a) the protection and preservation of natural resources, b) the growth of culture and knowledge, and c) a storehouse of decisions that help preserve cultural and biological diversity. Fruit species that are collected from their natural habitats rather than cultivated are considered wild edible fruits WEFs (Yangdon *et al.*, 2022). The food insecurity and the availability of non-seasonal produce provide premiums on WEFs (Yangdon *et al.*, 2022).

Recent epidemiological studies have demonstrated that those regularly consuming fruit have lower risk of getting chronic diseases (Torres-Guevara *et al.*, 2023). These results seem to be the result of the synergistic interactions of fiber, secondary antioxidant metabolites, vitamins, and minerals (Torres-Guevara *et al.*, 2023). Despite this, little is known about the nutritional value and bioactive components of tropical fruits, particularly the rarest species. Even more widespread species

lack sufficient scientific data, thus making it challenging to adequately culture them and comprehend their ecophysiology to best adapt them. A possible strategy to raise the standard of food accessible globally is to grow fruit crops (Fischer *et al.*, 2021). By 2050, the world population is predicted to reach 9 billion, increasing food demand by 50% above 2013 (Maggio *et al.*, 2019). As a result, there is an upsurge in interest in compiling data on wild food supplies across the globe (Singh *et al.*, 2016; Suwardi *et al.*, 2020; Yangdon *et al.*, 2022). However, domesticating other food-producing species and increasing the use of underutilized and neglected species, especially wild food resources, may be required to meet the world's food needs (Bélanger *et al.*, 2019). Wild food resources include a variety of consumables such as WEF, vegetables, mushrooms, orchids, canes, and medicinal plants (Yangdon *et al.*, 2022). Local communities are familiar with the use of native plants for food and other purposes, such as assisting with health problems (Syamsuardi *et al.*, 2022). The local knowledge that has been ingrained in the community for a long time has the power and capacity to contribute to the protection of forests (Kumsap *et al.*, 2016). However, in Wildlife Reserves of the Kurdistan region, the potential use of wild edible fruits has not thoroughly been investigated. On the other hand, the Wildlife Reserves in the Kurdistan region are increasingly threatened by rapid population growth of adjacent settlements. Population growth is believed to be a significant factor in the high conversion of primary forests into residential and plantation areas due to the growing need for agricultural and urban land. However, a number of studies have found a drop in public interest in wild forests and their edible wild fruits, especially among younger people (Syamsuardi *et al.*, 2022). This situation could lead to the long-term loss of a variety of wild species, including wild fruits that can be eaten, as well as the loss of traditional community knowledge on how to use natural resources. Therefore, the present study was aimed to know the wild growing diverse edible fruit and vegetables; and gather traditional knowledge about these plants in indigenous people from Kurdistan region of Iraq.

MATERIALS AND METHODS

Study area

The research area was in the Kurdistan region of northern Iraq (Fig. 1), which is home to many mountains, farmland, and four distinct seasons. Four provinces make up the Kurdistan region, Erbil (also known as Hawler), Sulaymaniyah, Duhok, and Halabja. Erbil is capital of autonomous Kurdistan region, which is part of federal Iraq. Geographically, the region is bordered by Syria in west, Iran in east, and Turkey in north. Due to the area's heterogeneity, data on wild edible vegetables were collected from the region's Erbil city from February 2022 to April 2023. The participant observation approach, in conjunction with open-ended interviews and questionnaires, was used to collect ethnomedicinal information (Kayfi *et al.*, 2021).

Data collection

Respondents (89) were given written documents detailing the study's rationale and indicating that the study's major purpose was to avoid the loss of traditional medicinal knowledge. Following an initial meeting outlining the objectives and methodology of the study, local leaders were asked to identify the members of families that had lived in the study area for many generations, held traditional knowledge

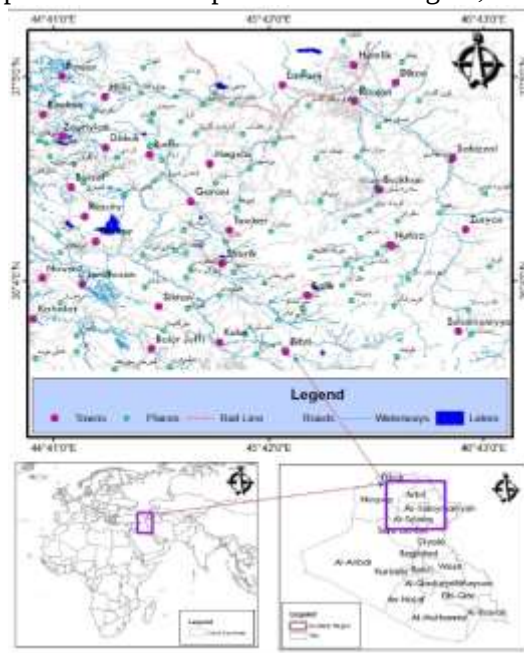


Fig. 1: Map of study area, Erbil, Kurdistan

about the use of wild plants, and were willing to participate in an interview (Urso *et al.*, 2016; Abdulrahman *et al.*, 2022). By asking respondents to recommend other respondents from other family units or "snowball" sampling, more respondents were reached. We mainly wanted to determine how widely used ethnobotanical practices are in the area and how they contribute to meeting the resident's basic requirements (Urso *et al.*, 2016). Demographic information, ethnic use, common names, components used, growing season of plants, administration routes, and traditional recipes were also recorded. Using the World Flora online (WFO) <http://www.worldfloraonline.org/>, the scientific names of these plants were verified.

Data analysis

Excel 2016 was used to compute the descriptive analysis. To determine the frequencies and percentages, the socio-demographic data regarding gender, educational attainment and employment status from the respondents was collected and used (Abdulrahman *et al.*, 2022; Hanun *et al.*, 2023; Jumare *et al.*, 2022). Using plant taxonomy information (Jumare *et al.*, 2022), the frequencies and percentages were calculated (Jumare *et al.*, 2022) with respect to the i) family occurrence, ii) species name, iii) form of the plant, iv) Kurdish name, v) plant part employed, vi) administration method, vii) the preparation method, viii) diseases treated, and ix) seasonal availability. The quantitative indices of ethnobotany used were:

Relative frequency of citation (RFC)

The above metric was used to rank plants by their importance to the ecosystem. In this formula, $RFC = Fc/N$, where Fc is the fraction of interviewees who mentioned the specific plant species and N is the total number of interviewees (Hanun *et al.*, 2023; Jumare *et al.*, 2022).

RESULTS AND DISCUSSION

Kurdistan is a cultural word referring to the ancestral homeland of Kurds. They have existed as an ethnically homogeneous people with their own culture and language since early times. The majority of respondents in this survey were in the age group of 41 to 50 (38.2%), followed by youngsters 30-40 (31.46%), then 51 to 60 (21.31%), and the eldest aged > 60 (8.9%) were the smallest category. The results showed a correlation between the respondent's age and the frequency with which they used wild edible vegetables and fruits. Indeed, because they have more life experience that has been passed down from one generation to the next, older people have more knowledge than youngsters. Those aged 30-50 make up majority since they were at their most productive professional stage and spend more time in interviewing and field collection. However, it seems that this knowledge is currently in danger of being lost because of its erratic assurance. There is a large risk of losing crucial ethno-medical knowledge about the area. The use of plants as medicine by younger generations is on the verge of extinction due to the lifestyle modernization (Kayfi *et al.*, 2021; Jumare *et al.*, 2022). Out of the 89 respondents interviewed, 33 were traditional herbalists, and 56 had some experience with conventional medicine. There were more males (73%) than females (27%). The phenomenon's prominence is attributable to the study community's culture and religion. Women in the community are burdened with housekeeping job. This incidence could be explained, at least in part, by the fact that the males are typically in charge of providing for their families (Jumare *et al.*, 2022). Probably, since the collection occurs in wild, women are unable to accept the risk and danger of being in wild. Except 10.11% respondents, all others had received western education (Fig. 2). Regardless of the respondent's education, there was no variation in the population's knowledge about the use of medicinally wild vegetables and fruits. Kurdistan's cultural heritage includes the knowledge of the effects and applications of plants, is passed down orally from generation to generation rather than being the sole realm of specialists or herbalists, as is the case with other traditional medical systems (Amin *et al.*, 2016). Medicinal wild plants can be found in any market, called as a souk or a bazaar.

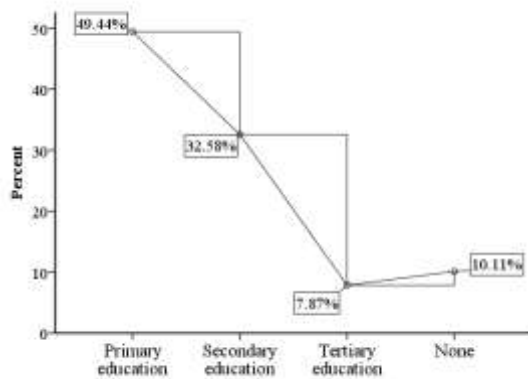


Fig. 2: Educational status of respondents from Erbil (Iraq)

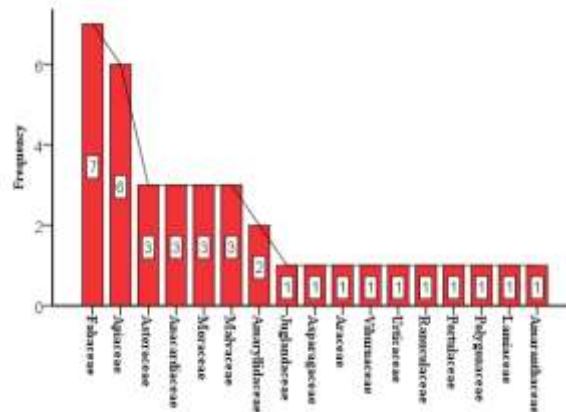


Fig. 3: Family diversity of wild vegetables and fruits of Kurdistan region of Iraq

The wild plants that can be eaten have more micronutrients and secondary metabolites than farmed plants (Iqbal *et al.*, 2019; Abdulrahman *et al.*, 2022). The prevention of chronic diseases depends heavily on food. The compelling evidence demonstrates that altering dietary habits, such as boosting the consumption of fruits, vegetables, and grains, is a workable method for drastically lowering the incidence of chronic diseases (Abbasi *et al.*, 2013). Traditional Ecological Knowledge depicts how indigenous people view their environment as well as significant facets of their history, culture, and socioeconomic structure (Urso *et al.*, 2016). There has been a lot of environmental stress on wild edible plants over the last two decades due to population explosion and climate change. Kurds reportedly use 37 medicinally valuable wild vegetables and fruits to treat diseases and improve their health. These plants are distributed through 17 families, with Fabaceae (18.9%) being the most dominant one, followed by Apiaceae (16.2%), Anacardiaceae, Moraceae and Malvaceae 8.1%, respectively, Amaryllidaceae (5.4%), and the remaining families (2.7%) respectively (Fig. 3). The present study revealed that the observed diversity of different plant families with medicinal importance is likely due to the good agro-climatic conditions of Kurdistan region for plant growth. The results are in agreement with respect to the plants belonging to Apiaceae family (Amin *et al.*, 2016). However, the findings contradict previous ethnobotanical reports from Kurdistan, which found Lamiaceae as the most common plant family there (Abdulrahman *et al.*, 2022). The possible causes for discrepancy include medicinal plant imports from neighboring nations (Kayfi *et al.*, 2021). Also, the variation is only species with high RFC are documented in present study. Members of Fabaceae and Apiaceae family grow exceptionally well in this region, which explains why there are so many of them in Asia and Kurdistan region. The ability of members of this family to endure drought and other environmental stresses have contributed to their worldwide dispersal.

Utilizing plant aerial parts is quite beneficial (Jumare *et al.*, 2022). Despite having little to no real grasp of the components of various plant sections, traditional healers employ them. The results reveal that leaves and fruits accounted for 26.42%, respectively, of all plant parts used (Fig. 4). The fact that leaves are more common may be because they are simple to gather with rich secondary metabolites (Abdulrahman *et al.*, 2022). As the plant's principal photosynthetic organ, leaves produce antimicrobial and antifungal compound, so are favoured over other plant parts due to the concentration of bioactive

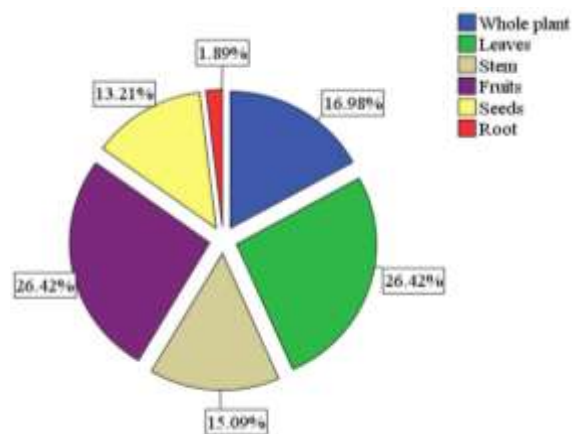


Fig. 4: Parts of the wild edible vegetables and fruits utilised

compounds in them (Ullah *et al.*, 2023). From a conservation perspective, using leaves is more sustainable and safer. Consumption of parts of vegetables and fruits is also linked to each ethnic and socioeconomic group's traditions and dietary habits (Mokganya *et al.*, 2019). Respondents thought that plant material gathered in forest's wild was more potent than the identical species found in gardens. Respondents reported that eating the harvested plant pieces raw or boiling them is the most common way of preparation (Table 1).

Many plants have varied growth patterns and maturity seasons (Jigme *et al.*, 2023). As a result, the abundance and availability of wild vegetables varies from season to season. Different edible wild vegetables and fruits plants were available in the study region throughout the year. The availability of edible wild vegetables and fruits increased as the season transitioned from winter to summer; spring (March-May), summer (May-September), autumn (September-December), winter (December-March) and then gradually reduced as the season transitioned back to winter. As a result, the wildest edible plants are picked in the spring, followed by summer, annual, autumn, fall, and winter (Fig. 6). The weather conditions become favourable for growth throughout the spring months. The rural inhabitants of this area have inherited a wealth of traditional wisdom, and documenting of this knowledge has provided new information on the area. This would not only provide acknowledgement for this undocumented information but will also aid in the conservation of rare and rapidly vanishing species. It will bring new pharmacological insights for improved human health care for a variety of diseases. The natural compound(s) obtained from plants serve as the basis for treating human illnesses. Some specific plants have a long history of use as medicine in a variety of ancient cultures for the treatment of ailments and the promotion of general health (Amin *et al.*, 2016). History of the region has revealed that many people in Kurdistan's isolated mountain towns have relied on plant parts; such as leaves,

Table 1: Wild edible vegetables and fruits found in Erbil, Kurdistan (Iraq), methods of preparation, disease treated by them, and seasonal availability

S. No.	Species name	Form used	Kurdish Name	Parts used	Preparation	Diseases/Ailments treated	Seasonal availability
1	<i>Chenopodium album</i> L.	V	Spinach	Whole plant	Eaten raw, boil, drink liquid	Improves immunity	Throughout the year
2	<i>Allium iranikum</i> (Wendelbo)	V	Lûshe	Stem, leaves	As soup	Haemorrhoid	May-June
3	<i>Allium paradoxum</i> (M. Bieb.) G. Don	V	Pîçk	Leaves	Fried or used in soup	Hypertension	January
4	<i>Pistacia eurycarpa</i> Yalt.	F	Daara Ban	Fruit, stem	Consumed uncooked. soup prepared with yogurt and wheat	Stomachache	May- June
5	<i>Pistacia khinjuk</i> Stocks	F	Qezwan	Fruit, stem	Consumed uncooked. soup prepared with yogurt and wheat	Stomachache	May-June
6	<i>Rhus coriaria</i> L.	F	Summaq-trsh	Fruits	Eaten raw	Stomach pain	June-July
7	<i>Ammi majus</i> L.	V	Baznaybuke	Whole plant	Boiled	Skin diseases	June-July
8	<i>Daucus carota</i> L.	V	Gezarka	Leaves at seedling	Boiled	Diarrhoea, indigestion, intestinal gas	June-July
9	<i>Falcaria vulgaris</i> Bernh.	V	Qazilla	Leaves	Boiled, eaten raw	wounds healing	June-July
10	<i>Lagoecia cuminoides</i> L.	V	Giyapshila	Seeds	Boiled	Improves digestion	Throughout the year
11	<i>Scandix pecten-veneris</i> L.	V	Giyadarzila, darzila	Leaves	Boiled, raw	Immunity booster	October-November
12	<i>Smyrnum cordifolium</i> Boiss.	V	Qallandor, Dori	Stem	Raw	Headache	March-May
13	<i>Arum dioscoridis</i> Sm.	V	Kardû	Leaves	Boiled	Cough	March-May
14	<i>Ornithogalum cuspidatum</i> Bertol.	V	Sebskola	??????	Boiled	Inflammatory related diseases	March-April
15	<i>Gundelia rosea</i> M. Hossain & Al-Taey	V	Kangr, Knr	Whole plant, stem, leaves	Boiled	Liver diseases, diabetes, pain, diarrhoea	March-May
16	<i>Scorzonera semicana</i> DC.	V	Aliqok	Leaves, roots seedlings	Boiled, eaten raw	Hypertension, wound healing	March-May

17	<i>Senecio vernalis</i> Waldst. & Kit.	V	Gyabzhar	Leaves, Seedling	Boiled, and then fried in oil with onion and eggs. and fried	Healing wound, health improvement	March-May
18	<i>Pisum sativum</i> L.	V	Kalixatuna	Fruit, leaves, seeds,	Raw, boiled,	Diabetes, heart diseases.	June-July
19	<i>Medicago polymorpha</i> L.	F	Qunjirka, nusaka	Fruit	Eaten raw	Health improvement	March-May
20	<i>Onobrychis caput-galli</i> (L.) Lam.	F	Qunjirka	Fruit	Eaten raw	Health improvement	March-May
21	<i>Prosopis farcta</i> (Banks & Sol.) J. F. Macbr.	F	Charnook	Fruits	Eaten raw	Constipation, haemorrhoids, tooth pain	July & August
22	<i>Scorpiurus muricatus</i> L.	V	Gulaxazem-xazemoka	Leaves	Boiled	Fever, internal inflammation	March-May
23	<i>Viciana rbonensis</i> L.	V	Kalikakoz	Fresh seed, young pod	Eaten raw	Eyes related disease	March-May
24	<i>Quercus trojana</i> Webb	F	Barruu	Fruits	Grill in fire, remove testa before eating	Stomach pain	March & April
25	<i>Juglans regia</i> L.	F	Guweiz, geez, Gweez	Seed, immature fruit	Young fruit: jam, mixing with dried dates	Heart diseases, hair loss, constipation	March & April
26	<i>Mentha longifolia</i> L.	V	Puunga	Stem, leaves	Eaten raw, boiled, mix with yogurt as soap; used as scent, spice, the leaves can be added to salads	Headache	Throughout the year
27	<i>Alcea kurdica</i> (Schltdl.) Alef.	V	Heiro	Leaves	Chooped with rice or wheat making Dolma		March-May
28	<i>Malva neglecta</i> Wallr.	V	Tollka, Giyapaniroka	seed, leaves	Cooked with rice making Dolma, fruits are eaten raw.	Pain, inflammation, haemorrhoids, renal stones, constipation, infertility	March-May
29	<i>Malva sylvestris</i> L.	V	Tollka, Giyapaniroka	Whole plant, leaves	Boiled, and then fried in oil with onion and eggs. Cooked with rice making Dolma, fruits eaten fresh.	Wound healing, stomachache	March-May
30	<i>Ficus carica</i> L.	F	Tawska, Hnjer	Fruit	Eaten raw, jam	Parasite infections, heart disease	July-August
31	<i>Morus alba</i> L.	F	Shatuu	Fruit	Eaten raw, jam	Reduce high cholesterol, obesity, and stress.	June-September
32	<i>Morus nigra</i> L.	F	Tuurasha	Fruit	Eaten raw, jam	Diabetes, constipation, sore throat, high blood pressure	June-September
33	<i>Rheum ribes</i> L.	V	Rêwas	Stalks	Raw as a healthy and social snack, often consumed with salt	Diabetic, hypertensive.	March-April
34	<i>Portulaca oleracea</i> L.	V	Pelpine	Leaves, stem	Raw in salads or cooked with lentils	Improves immunity	Throughout the year
35	<i>Adonis aestivalis</i> L.	V	Gulanisan	Whole plant	Boiled, and then fried in oil with onion and eggs.	Hearts diseases, coughs	April & May
36	<i>Elatostema lilyanum</i> Rechinger	V	Sûrebne	Whole plant	Boiled, fried	Wounds healing	October-December
37	<i>Sambucus cerulea</i> Raf.	F	Drkana tuu	Fruits	Freshly eaten and make jam	Constipation, cold, flu, skin diseases, respiratory diseases	August-September

Note: V = Vegetable, F = Fruits

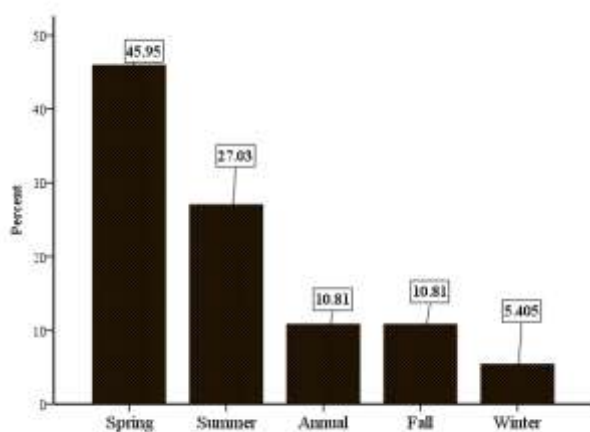


Fig. 5: Seasonal availability of wild edible vegetables and fruits

internal inflammation, eyes related disease, hair loss, renal stones, infertility, anti-parasite, reduce high cholesterol, obesity, and stress (Table 1, Fig. 6) were reported to be treated by the frequent usage of the documented wild vegetables and fruits in the region. The RFC value of a plant species explains its popularity among residents of the region. The study only included plants with an RFC value of at least 0.4 (Table 2). Values for the RFC were between 0.4 and 0.8. The highest relative frequency of citations demonstrates widespread familiarity with these therapeutic plants among conventional medical practitioners. Further well-designed clinical trials are required to confirm preclinical findings, although human safety and efficacy have not yet been completely examined. There needs to be research into the underlying mechanism. There is important to establish a safe dosage standard.

Conclusion: The study showed that the people believe wild fruits and vegetables offer therapeutic benefits. The current study identified 37 wild edible plant species from 17 families, these plants are used for a variety of medication purposes. There is a comparatively large diversity of vegetables used for medicinal purposes, and there is also well-maintained community knowledge regarding the usage of wild fruits and vegetable plants across all age groups. The findings in this analysis will also give locals in the area a good starting point for selecting important wild vegetables for therapeutic purposes. The study concludes that the region possesses highly specialized indigenous plants with a wide range of therapeutic benefits. This region has a lot of potential for growing various sorts of wild edible fruits and vegetables. Unfortunately, many of the wild edible plants in the study area are under increasing threat from anthropogenic and socioeconomic reasons. As a result, the local regulatory system should be formed with the participation of the local people, considering their social practices and customs. To attain food security in the future, such a system might build community-based harvesting locations and provide sustainable harvesting recommendations to the community.

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roots, bark, and oils as their only source of treatment for many years (Amin *et al.*, 2016). Modern medications and human health management have benefited greatly from the use of plants. Traditional knowledge is crucial to many people's daily lives all throughout the world. Globally, the significance of medicinal plants has increased, having an impact on both global trade and worldwide health. The following diseases improve body immune, haemorrhoid, hypertension, stomach pain, skin diseases, diarrhoea, indigestion, intestinal gas, wound healing, improving digestion, headache, cough, inflammatory related diseases, liver diseases, diabetes, pain, diarrhoea, diabetes, heart diseases, constipation, haemorrhoids, tooth pain, fever,

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