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Botanical Study of Wild food plants in Kurdistan, Iran

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I dedicate this thesis to the brave Kurdish and Iranian people, and all people who are fighting for democracy, especially to the courageous Iranian women who are fighting for their freedom and rights against dictatorship.

May God bless freedom and Democracy.

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Abstract

An ethnobotanical field research with a focus on wild plants usage was conducted in eight villages in two different regions in Kurdistan of Iran among Sunni-Muslim Kurdish people, through 34 interviews with local people of those villages. Information about 52 identified wild food plants has been collected through fieldwork and semi-structured interviews. The purpose of this thesis is to examine how wild plants are used by two Kurdish ethnic groups in two different regions and to compare the ways in which they utilize wild plants in each region. As part of the in-person interviews, information about cultural differences, preservation methods, and culinary uses of these wild plants were additionally gathered as a result of the interviews. Diverse ethnic groups and diverse religions can teach us better ways to preserve our natural resources and how to live in harmony with the environment in order to create safer, cleaner, and more sustainable food resources and ways of life, which will benefit the creation of safer, cleaner, and more sustainable food resources. Increasing the availability of information and dissemination of cultural knowledge related to the use and collection of wild plants is of utmost importance.

Keywords: Ethnobotany, Kurdistan, Wild food Plants, Food, Sunni Muslims

Chapter 1. Introduction

Wild Food plants (WFP) are native plant species that do not require cultivated cultivation to grow and reproduce, and as a result, grow and reproduce naturally (Motti 2022). WFPs are non-domesticated species' food products harvested or collected from a variety of habitats, including wastelands, agricultural fields, water bodies, and forests, for human consumption(Edwin 2022). Broadly speaking, (Heywood 1999) is referring to all plants that grow spontaneously in natural or semi-natural ecosystems and are independent of direct human intervention. The human race has been gathering and using WFPs in their diets and food systems since ancient times(Lele and Goswami 2021). The WFPs continue to play a crucial role in ensuring food sovereignty and food security, as well as contributing to the well-being of vulnerable households, especially during times of food scarcity and food insecurity(Motti 2022). The role of wild food in times of human crisis has been critical in providing the population with food, especially in the regions under siege during war times when it was necessary to sustain life for the population(Tomkins et al. 2019; Jman Redzic 2006).

Furthermore, WFPs can empower local market actors, which can reduce the distance between consumers and producers, thereby reducing the overreliance on globalized value chains and empowering local market actors (Borelli et al. 2020). Although the current global food system can provide enough food for mankind, many people still do not have access to a nutritious diet or suffer from hunger, also the increased consumption of highly processed foods can negatively impact on the human health (Motti 2022). Besides climate change, malnutrition (including over and undernutrition) is considered a global threat, which indicates that a healthier and more sustainable food system is urgently needed(Motti 2022).

In some regions of the world, WFPs can therefore be a vital component of people's diets, providing greater dietary diversity for those who rely on WFPs. Often, food plants have medicinal properties as well, and many are used as herbal remedies for the treatment of several ailments in folk phytotherapy (Motti 2021). In addition to their high levels of vitamins, phenolics, flavonoids, antioxidants, microelements, and fiber, they are often regarded as functional foods because of their clear health benefits. Moreover, wild plants are perceived as a healthier alternative to cultivated vegetables that may be contaminated with pesticides and other chemicals. It is therefore possible that wild plants may have a great potential as sources of bioactive compounds, colorants, dietary supplements, and other unusual compounds(Motti 2022).

As a result of recent advancements in the field of ethnobotany, there has been a resurgence in interest in the connection between WFPs and specific types of traditional knowledge(Cotton 1996; Cunningham 2001). The human population consumes thousands of different parts of wild plants as food every day. People's ability to make a living is dependent not only on the products of agriculture and animal husbandry, but also on other natural resources such as edible plants found in the wild(Sundriyal and Sundriyal 2004; Cunningham 2001). In the majority of remote areas, a significant portion of the local population does not have sufficient food to meet their daily requirements, and as a result, they primarily rely on their cultures to nourish various kinds of wild food(Balemie and Kebebew 2006; Reyes-García et al. 2006). Locals have access to a basic food source through WFPs. Indigenous people have access to a complementary food source, and poor communities have access to an alternative source of money through selling the WFPs (Sundriyal and Sundriyal 2004; Amente 2017). Despite this, the taxon of wild plants that can

be consumed are still, for the most part, ignored in land-use projections and practices, economic development, and efforts to preserve biodiversity(Galalaey et al. 2021).

The customary qualities and traits of the plant species have been passed down from one generation to the next as a part of the natural course of everyday life. The vast majority of this traditional ecological knowledge is passed down orally rather than being written down anywhere; rather, it is preserved as part of an oral tradition(Cotton 1996; Shinwari et al. 2003). As a direct result of this, the majority of ethnobotanical research conducted in recent years have concentrated on developing lists of WFPs and the culinary uses of these species(Galalaey et al. 2021). For this reason, in the current study, the following objectives were pursued:

1. to investigate and record the traditional knowledge of the local people regarding the wild plants that are used in their food in two regions: Mukriyan region, which is located in the province of West Azerbaijan in Iran; and the Hawrami people, who live in the Hawraman region, located in the province of Kurdistan.
2. in order to spread awareness of the effects that harvesting has on the natural population dynamic of their species.

1.1 Kurdistan

This Kurdish homeland is an ill-defined cultural region with a population of approximately 20 million Kurds. Kurdistan encompasses northeast Iraq, northwest Iran, the eastern and southeastern of Turkey, and northern Syria. The Kurds are an ethnically homogeneous group with a rich folkloric tradition, a distinct culture and language, and a wide range of different dialects(Amin et al. 2016). In Iran, this ethnic group resides predominately in the zone

between Azerbaijan and Lorestan, as well as certain adjoining regions to the west of the Zagros mountain chain (Figure 2), all of which are characterized by a rich and stunning biodiversity(Hosseini et al. 2022). Specially Hawraman region is not only unique in terms of its flora and fauna, but it is also rich in cultural traditions, with numerous ceremonies such as the annual "PirShaliar" and "Komsai" festivals(Hosseini et al. 2022). Recently, the Hawramant district of Kurdistan province was added to the UNESCO world heritage list. https://whc.unesco.org/en/list/1647.

1.2 Literature review

Field ethnobotanical surveys in Kurdistan have mostly focused on medicinal plants, and relatively exclusively in North Kurdistan (Turkey) and in Zaza-speaking areas(Tabata et al. 1994; Özgökce and Yilmaz 2003; Özgökçe and Özçelik 2004; Cakilcioglu and Turkoglu 2010; Ertug, Polat, and Cakilcioglu 2012; Altundag and Ozturk 2011; Khatun et al. 2012; Tetik, Civelek, and Cakilcioglu 2013; Polat, Cakilcioglu, and Satıl 2013; Kaval, Behçet, and Cakilcioglu 2014; Hosseini et al. 2022). While there has only been a limited amount of research conducted on the traditional medicinal plant knowledge of Kurdish healers, herbal drug sellers, and dye plant traders in the Iraqi and Iranian parts of Kurdistan(Nemati Paykani and Jalilian 2012; Mati and de Boer 2010; 2011; Ghasemi Pirbalouti, Momeni, and Bahmani 2012; Tahvilian et al. 2014; Naqishbandi 2014; Ahmed 2016; Pieroni, Ahmed, and Zahir 2017; Pieroni et al. 2018; Hosseini et al. 2022). It should be noted that despite of their prevalence, only a few studies have been conducted on the wild foods consumed by Kurds (Kurmanji speakers) in northern Kurdistan(Doğan 2015; Cakilcioglu and Turkoglu 2010) and only en passantly by Southern Kurdish Sorani speaking people(Ahmad and Askari 2015; Hovsepyan et al. 2016; Pieroni et al. 2018; Pieroni, Ahmed, and Zahir 2017). In spite of this,

Kurdish food traditions are rarely discussed in international anthropological literatures. For these reasons, the author decided to conduct a field work study in East Kurdistan (EK) and to participate in completion of data of Four regions in Kurdistan. It is also good to mention that the current study was inspired by the works of (Pieroni et al. 2018; Pieroni, Ahmed, and Zahir 2017). It was of particular interest to the author of this thesis to examine the cultures, food habits, preservation methods, and interactions of people with their natural environment. This study was specifically in the area of Wild Food Plants (WFPs), in these regions and ethnic groups. The studies about wild food plants in Kurdish-speaking areas and surrounding regions are becoming increasingly interesting to focus on and study. For this reason, the following four topics were chosen to investigate during this master thesis:

- What type of WFPs they are using and how?
- To maintain a sustainable food resource, what methods of preservation are they using?
- Regarding WFPs use, can these two ethnic groups be distinguished by a significant difference?
- Are local people familiar with the WFPs in their region?

It was possible to finalize this thesis' main focus after clarifying the meaning of "Wild Food Plants", identifying the different values conveyed by WFPs use, and specifying who the potential survey would be intended for. All the used methods and interviews were learned during an ethnobotanical internship, and are similar to methods that conducted by (Pieroni et al. 2018; Pieroni, Ahmed, and Zahir 2017).

1.3. Study area

The Mukrian region is bounded to the north by Oshnavieh, Lake Urmia, and Maragheh, and to the south by Kurdistan province. This territory shares natural borders with Iraqi-Kurdistan and Tekab region in East Azerbaijan Province, respectively, and is located within certain natural boundaries. From the Greenwich meridian, this area is located between 35°54' and 36°52' north latitude and 44°45' to 46°33' east longitude. This area's elevation from Lake Urmia is 1,220 meters, although it rises to 3,000 meters in the west and south. The following mountainous villages were visited in May 2021: Guliyar (1565 m a.s.l), Kaveis (1415 m a.s.l), Rafteh (1645 m a.s.l), and Kala Gavi (1650 m a.s.l) (Figure1).

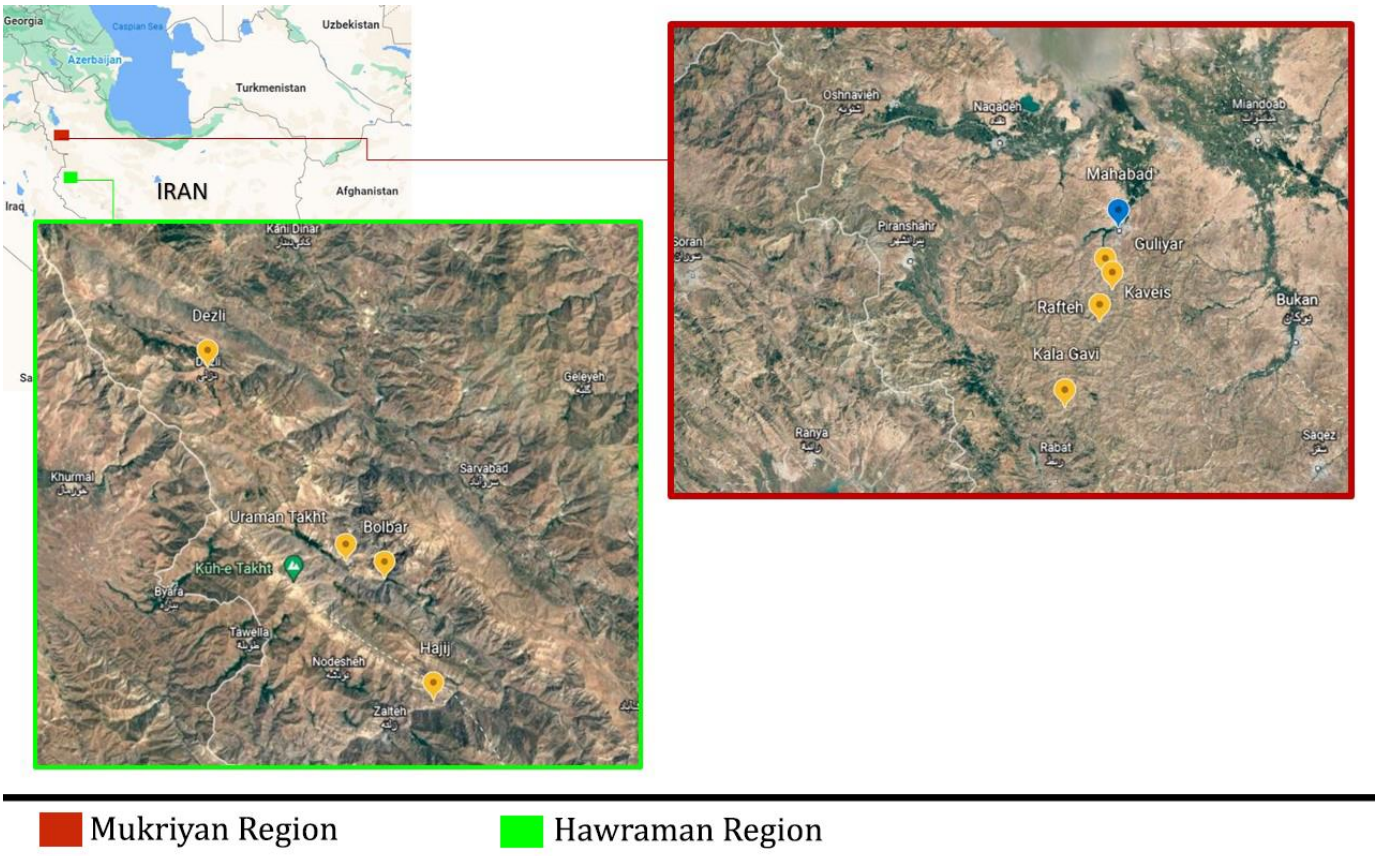

Figure 1.Geographical location of Mukriyan and Hawraman region

Each village counting a population between 50 and approximately 200 inhabitants. These visited villages are all speaking Kurdish Sorani and are Sunni Muslims. Most of the locals are bilingual and can also speak Persian, as it is the country's only official language.

Hawraman (also known as Hawrāmān, or Avroman, or Awroman) is a mountainous region along the western border of Iranian Kurdistan. It stretches approximately 50 kilometers from a point west of Marivan (46° 0' east longitude, 35° 30' north latitude) to the confluence of the two branches of the river Sirvan (46° 20' east longitude, 35° 10' north latitude) in the south-east. The highest peak in the Kūh-e Owarman range is Kūh-e Takht, which measures 2,985 meters in height. It is continued to the south of the Sirvan river by the 3,223-meter-high Kūh-e Šāhō. Parallel to these, east of the Sirvan river, is the 2,597meters in height, Kūh-e Sālān (Encyclopedia Iranica 2022).

Figure 2. Zagros Mountain chains near Dezli, and Hawraman takht. Photo by F. Salehi 2021

Chapter 2. Methodology

2.1. In search of the interview questions

Following an in-depths literature review, several weekly workshop with the supervisor and co-supervisors and, based on the important information that is necessary to be addressed, a tailor-made table, to be filled by the information that the interviewees are providing, was designed. Once all the questions were found and organized properly, a few simulating interviews with knowledgeable people were conducted to find out and to make sure the questions were relevant and correctly addressed the issue. It is important to mention, the author made sure that after collecting the information from interviewees, no sensitive information could threaten anyone's privacy by answering to the interview questions. The collection of data, as well as their treatment assured a complete anonymity for all the participants of the questions, and no confidential and personal data were to be collected from them. In Annex 1. The list of asked mentioned plants are presented.

2.2. In search of choosing interview locations

In order to find out the answers for the thesis question, it was important to select the locations of the interviews on a logical base with a view of comparison with other conducted works for future studies. The author, with the recommendation of his supervisor, decided to only focus on interviewing people who lived in rural areas and not in the cities. As the author found out the city residents can be affected more by the modernity and generalized food habits due to their accessibility to a variety of markets. On the other hand, due to distance from cities and less accessible roads, the rural people are having less access to a diverse range of foods compared to the people in the city. Moreover, for the purpose of comparing

two different ethnic groups, four villages in Mukriyan region and four villages in Hawraman region were selected to be studied.

It is important to mention that as there have been studies conducted by (A. Pieroni, R. Soukand et al. 2018), in Iraqi-Kurdistan villages. The similarity of altitude of the selected villages was considered. In general, the altitude of the selected villages, ranges from 800 m.a.s.l to 1650 m.a.s.l whereas the altitude of the previous studied villages by the mentioned authors were ranging from 650 m.a.s.l to 1460m. (Table 1) shows the name of the villages, the province, and the altitude of the selected villages.

Table1. Demographic profile of the local informants in the Visited villages, Number of informants in each village, altitude of each village (n=34)

Village		ELEVATION (m.a.s.l[1])	INTERVIEWED PEOPLE
Hawraman takht	Kurdistan Province, Iran (Hawraman region)	1400	7
Dezli		900	3
Bolbar		800	1
Hajij		1000	1
Guliyar	WestAzerbaijan, Iran (Mukriyan region)	1565	5
Kalagavi		1650	7
Kaveis		1415	5
Rafteh		1645	5

1.m.a.s.l: meters above sea level

Another important factor in choosing villages to conduct research on, was their closeness to the borders of the country, as these types of villages are normally farther from cities than other villages and consequently, they are less affected by cities and more people are relying on their local resources and their environment.

2.3. In search of choosing interviewees

In order to identify possible local traditional knowledge holders, we used the snowball methodology in order to identify the majority of middle-aged and elderly residents living in rural areas who may be local traditional knowledge holders. the main focus for choosing the interviewees was based on the real-life experience and usage of WFPs and the knowledge that they have received from their past. For this reason, the majority of the interviewees were elderly locals since they spend most of their life in the same village and were locals. However, here is also a group of interviewees with an age range of 26 to 30 years old. It was also imperative to select interviewees based on their education level. This is because the author discovered that a person living in the city and studying in academic fields might not make an ideal candidate for this study, as their information could be influenced by their experience in the city and their studies. For this matter, the majority of the interviews were conducted with people who were not educated or had only basic education. The interviewees range in age from 40 to 80 years old with exceptions of four interviewees with an age range of 25 to 28. In addition, we obtained verbal consent from each participant before conducting each interview and followed the Code of Ethics of the International Society of Ethnobiology ("Information Sharing Environment (ISE)Privacy Policy," 2013).

Figure 3. Interviewing with local people in Dezli, Hawraman. Photo by F. Salehi 2021

The author gave each informant a code starting from FKI1 which F represents the first name of the author, K represents the general location of the research and I, as a representation of the name of the country in which the research has been conducted. Among the information asked from the local informants were, gender, village, parish, region, age, attitude to WFPs and traditional medicine knowledge, how long they lived outside the village, their education, and their occupation. The mentioned details are listed in Table2.

2.4. Data Collection

There was a need for both quantitative and qualitative data in this study. This thesis will cover the former in detail in order to be able to establish its statistics, and the latter in order to understand the justifications. After availability of the interview questions, and upon arrival in the country of research (Iran), the desired villages were written down and prioritized according to their distance from the author's original city of birth in Mahabad. During the first visit, the author visited four villages in the Mukriyan region in West Azerbaijan, Iran. In all, 22 people were interviewed in these villages. This region was the subject of a two-day fieldwork study with 13 females and 9 males. Due to the fact that most of the men were working in their fields and farms during the conducted interviews, the number of female interviewees was higher than the number of male interviewees. Because of this, only females and elderly men could be interviewed by the time of visiting villages.

Informant code	Gender	Village	Parish	Region	Age	Attitude to wild food and traditional medicine	Spent more than 1 year outside the region	School education (years)
FKI01	M	Guliyar	Mahabad	Mukriyan, WE	66	Average	Never	5
FKI02	F	Guliyar	Mahabad	Mukriyan, WE	50	Average	First 15 years of her life	0
FKI03	F	Guliyar	Mahabad	Mukriyan, WE	27	Average	Never	5
FKI04	F	Guliyar	Mahabad	Mukriyan, WE	29	Average	Never	5
FKI05	M	Guliyar	Mahabad	Mukriyan, WE	62	Average	2 Months	2
FKI06	F	Kaveis	Mahabad	Mukriyan, WE	80	Average	Never	0
FKI07	F	Kaveis	Mahabad	Mukriyan, WE	41	Average	10 years	5
FKI08	F	Kaveis	Mahabad	Mukriyan, WE	45	Average	Never	5
FKI09	M	Kaveis	Mahabad	Mukriyan, WE	50	Average	work in city	12
FKI10	M	Kaveis	Mahabad	Mukriyan, WE	52	Average	8 years of school	8
FKI11	F	Rafteh	Sardasht	Mukriyan, WE	81	Average	3 years	0
FKI12	F	Rafteh	Sardasht	Mukriyan, WE	49	Average	Never	0
FKI13	F	Rafteh	Sardasht	Mukriyan, WE	32	Average	Never	5
FKI14	M	Rafteh	Sardasht	Mukriyan, WE	55	Average	Never	5
FKI15	F	Rafteh	Sardasht	Mukriyan, WE	55	Average	20 years	0
FKI16	F	KalaGavi	Sardasht	Mukriyan, WE	40	Average	Never	5
FKI17	M	KalaGavi	Sardasht	Mukriyan, WE	26	Average	Never	16
FKI18	M	KalaGavi	Sardasht	Mukriyan, WE	30	Average	Never	18
FKI19	F	KalaGavi	Sardasht	Mukriyan, WE	70	Average	Never	0
FKI20	F	KalaGavi	Sardasht	Mukriyan, WE	57	Average	Never	0
FKI21	M	KalaGavi	Sardasht	Mukriyan, WE	55	Average	Never	5
FKI22	M	KalaGavi	Sardasht	Mukriyan, WE	60	Average	Never	0
FKI23	M	Dezli	Sarvabad	Kurdistan	49	Good	Never	5
FKI24	M	Dezli	Sarvabad	Kurdistan	52	Good	8 years of school	8
FKI25	M	Dezli	Sarvabad	Kurdistan	51	Basic	Never	6
FKI26	M	Hawraman Takht	Sarvabad	Kurdistan	52	Very good	Never	0
FKI27	M	Hawraman Takht	Sarvabad	Kurdistan	55	Very good	Never	0
FKI28	M	Hewraman Takht	Sarvabad	Kurdistan	42	Very good	Never	0
FKI29	M	Bolbar	Sarvabad	Kurdistan	50	Good	Never	0
FKI30	M	Hewraman Takht	Sarvabad	Kurdistan	37	Not good	Never	16
FKI32	M	Hewraman Takht	Sarvabad	Kurdistan	65	Not good	Never	0
FKI33	M	Hewraman Takht	Sarvabad	Kurdistan	51	Not good	Never	8
FKI34	M	Hajij	Paveh	Kermanshah	61	Not good	Never	12

FKI: Farzad, Kurdistan, Iran.
0 Means the informant has not received any school education

Following the previous area, four other villages were planned to be visited in Hawraman region in Kurdistan, Iran after the previous region had been completed. As the language of the scheduled villages was Hawrami, and the author was not able to speak this language, a trusted companion from Marivan city, accompanied the author for translation and introduction purposes. The interviews in this region also took two days to complete. During these two days, in all, the author had the chance to conduct interviews with 13 males. The gender of interviewees were all males due to two reasons. First, the majority of the people living in these villages were shopkeepers who, at the time of the interview were available to answer the interviewer's questions. While their wives were at home, and busy with cooking, cleaning, or their personal matters. Second, due to cultural reasons, the interviewer was not sure that the male residents of these villages will be comfortable letting their wives participate in the interviews. For this reason, the writer did not conduct interviews with females in this region. The conducted interviews were recorded if an interviewee agreed; with the promise to use the recording only for transcription. Notes were taken and in places that was possible, some photos were taken as well.

2.5. Questions asked

The specific structure of the WFP questionnaire was adapted for this thesis. The adaptation of the questions followed the cultural and the geographical peculiarities of the regions of study, in order to have comparable and concrete data in both interviewed regions, the questions for all 34 interviewees were the same. Nevertheless, the order in which questions were asked for each individual varied depending on the interview, the given answers and the flow of the interview. Alongside the main questions, a section was dedicated to the respondents' additional information and their comment regarding a specific WFPs that they

mentioned during the interview. This section will be added to a database which will include all the mentioned tables, graphs, figures, collected samples, and the interviewed questions. A variety of WFPs were asked from the interviewees, including non-cultivated vegetables; wild plants used in baking, or home-made fermented products; wild fruits and other plants used in sweet preserves and/or liquors; and wild plants used to season foods and brew herbal teas at home. We recorded local names and a description of traditional culinary use for each of the listed plants.

2.6. Sample Collection

A total of 43 different WFPs were collected while visiting the first region in Mukriyan. These plants have been preserved in newspapers and pressed for two weeks after being collected. Once they have dried properly, they have been attached to A3 size pieces of paper to be sent for identification, obtaining international codes, and keeping them under favorable conditions. Among these 43 WFPs, there are some plants that are also mentioned by interviewees. It should be noted that, as the research field was conducted in the last month of Spring. Consequently, most of the under discussion WFPs were dried or collected before and was not possible to collect and add to the sample collection. In Hawraman, no plants were collected, mainly because the dry season began early, and they had already been collected.

2.7. WFPs identification

Plants were identified using the Iran Flora (Assadi, M 1989-2000). The plant list database through World Flora Online (WFO), (POWO 2022), and asking a knowledgeable person in this field . All local plant names were transcribed from the recorded local languages and local

names using the Latin alphabet to their scientific Latin name. As of the time of writing this thesis, some of the collected plants had yet to be identified.

2.8. Quantitative and Qualitative Data analysis

To analyze the data extracted from the created tables, a Microsoft Excel spreadsheet was used. With the help of this software and MS Powerpoint, statistics were displayed, figures were created, and the proportions of variables were calculated. As part of the quantitative analysis, we collected data on the number of respondents. Further, qualitative data is used to observe factors such as the abundance of a WFPs, the frequency of using it, its popularity, its preparation and preservation method, the parts of a WFPs that can be used, as well as the changes in habitation.

Chapter 3. Results

In accordance with the information provided by the informants, the author developed a list of wild vegetables commonly consumed during the spring season and some plants during summer, that included botanical taxa, families, reference codes, and folk names recorded in both of the study areas, plant parts used by the informants in the study areas, their traditional culinary uses, as well as the frequency with which they are quoted (Table 3).

In total, 60 different ethno-taxa were mentioned during the interviews. Overall, 51 plant taxa were identified by the author. While eight plant taxa and one fungi taxon remained unidentified. There are many vegetables that are eaten raw: raw, washed, fresh, leafy vegetables, and sometimes aromatic plants appear on the domestic table of the people living in the Mukriyan and Hawraman regions primarily as side dishes, to be eaten by hand before a meal, very much like the Persian dish *sabzi*. It is common for both children and adults there to snack on fresh wild vegetables and especially peeled stalks of wild plants with or without salt (depending on which plant it is) during activities such as mountain hikes, casual conversations, watching TV, etc. As a result of our study participants, we were able to determine a few other wild vegetables, which are consumed or boiled after they have been lactofermented. In addition, a few other wild vegetables are boiled or consumed after they have been lactofermented, whereas lactofermentation is one of the ways that people use to preserve a few wild vegetables. As seasoning ingredients, nine plants were mentioned as a total of nine different plant taxon. It was found that the majority of the plants that were surveyed were also available at local markets. As a result of this, the domestic, small-scale trade in WFPs continues to exist and, possibly, is a viable economic activity, which is generally managed by the male members of the community. Furthermore, according to the

information obtained from the interviewees in Mukriyan region, women were also involved in the trading of WFPs. As some of them personally have reported the experience of collecting and selling a part of their collected plants to the local markets or their relatives.

3.1. WFPs used

As a result of the information provided in the interview, the author was able to conclude that among these two ethnic groups, the main plants mentioned are among the plants belonging to the *Amaryllidaceae* and *Lamiaceae* families; for each of these taxa family eight plants recorded. Additionally, seven taxa in *Apiaceae*, four taxa in *Asteraceae*, and four taxa in *Brassicaceae* were recorded.

3.2. To maintain a sustainable food resource, what methods of preservation are they using?

From the information collected during the interviews. The main methods of preservation were yellowing *(Zard kerden)*, lactofermentation *(Tizhaw)*, drying, and freezing. A list of preservation methods for each taxon is presented as well in table 3. One of the most common preservation methods was yellowing. Depending on the plant taxon and "the strength of the plant to be boiled".

3.2.1. Yellowing *(Zard kerden)*

In light of the given information from the informants, the procedure for yellowing is as follows: In the first place, the plant must be rinsed with water in order to remove any dirt from it. The plant will be chopped into dice or larger pieces depending on the size and taxon of the plant. A freshly chopped plant will be added to boiling water until it begins to turn yellow, which is why this method of preservation is referred to as "yellowing". After boiling the yellowed plant, it will be rinsed, and the remaining water will be squeezed out of the

plant using a heavy stone or with hand. Later on, the yellowed plants will be packaged in freezer plastic portions and stored in a freezer for a longer period of time. In this method, plants are preserved for an extended period of time. The informants, however, suggested that despite this, a plant preserved by yellowing is better to be used within a year of its preservation. Based on the interviews conducted by the author, the author discovered that the Mukriyan region is more likely to use this method. In Hawraman and Mukriyan region, the yellowing process were used for preserving *Gundelia tuornefortii*. *Cirsium vulgare, Allium jesdianu, Falcaria vulgaris, Allium ursinum, Eremurus spectabilis.*

3.2.2. Freezing

Due to the small size and the use of a list of wild plants, another group of plants were not yellowed. Instead, they were lactofermented or frozen without boiling. This is in order to preserve their flavor. As a second method of preservation, freezing has been favored by both informants in Mukriyan and Hawraman. In order to effectively freeze the plants, first they will be rinsed with tap water, then dried, chopped and stored in freezer plastic in favorable portions, and then frozen once the excess water has removed. By using this technique, the taste and usability of each plant will be preserved, and the plant will be able to be used for a longer period of time. The informants suggest that the preserved plants be used within a year or two of their preservation, similar to the yellowing method. *Allium schoenoprasum, Mentha requienii, Lepidium persicum,* were among those plants preserved by freezing.

3.2.3. Lactofermentation

Plants such as A*llium vineale, Chaerophyllum macrospermum, and Prangos ferulacea* have been found to be lactofermented. Several informants have described the lactofermented

Figure 4. Lactofermented Prangos ferulacea,Chaerophyllum macrospermum and Biza HSK14 (unidentified scientific name). Photo taken by F. Salehi 2021

process. With milk-based products like cheese or kafir (doogh), the water obtained from boiling these products which is called "Tizhaw" can be used for lactofermentation of these mentioned plants. A picture of three lactofermented plant is shown in Figure 4, including: *Prangos ferulacea,Chaerophyllum macrospermum and Biza HSK14*(Unidentified)after lactofermentation.

3.2.4. Drying

There were a large number of plants reported that were neither yellowed nor lactofermented. Rather, these plants are dried. According to the people interviewed in Mukriyan and Hawraman, "this preservation method and freezing are the most commonly used methods of preserving WFPs". Depending on the taxon of the plant, this method involves either drying the plant outdoors in mild sunlight or indoors in the room temperature. According to Table 3, the following plants have been reported as having drying

preservation: *Artemisia, Alcea, Allium ursinum, Biarum bovei, Cicer kermanense, Echium italicum, Eryngium Tourn, Eremurus spectabilis, Hyssopus officinalis, Lepidium persicum, Mentha longifolia, Mentha requienii, Pistacia atlantica, Stachys lavandulifolia, Pimpinella, Thymes, Thymus vulgaris, Tragopogon pratensis, Urtica, Viola*. The dried plants are normally stored in glass jars after drying to prevent humidity from affecting them. In order to maintain the quality of the dried plant, it is also important to keep it away from direct sunlight.

3.3. Are local people familiar with the WFPs in their region?

Considering that the under-discussed regions are situated far from urban centers and therefore have limited access to the services provided by those cities within their region, understanding their knowledge about their environment and their available food resources is essential. We observed the informants' knowledge of their local wild plants and their attitudes to WFPs based on the information they provided and their personal statements (Figure 5).

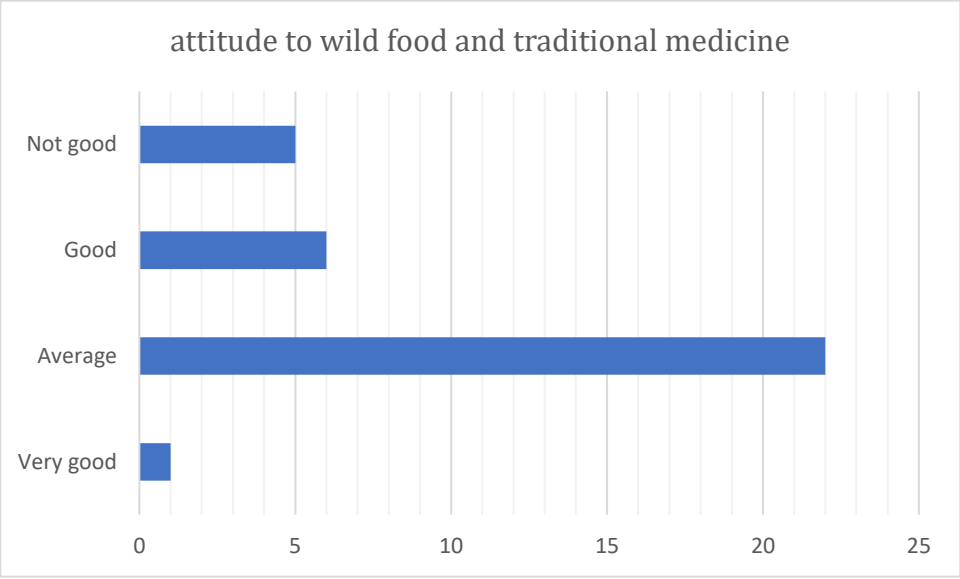

Figure 5. Knowledge of informants regarding Wild plants

3.4. Differences between two ethnic groups

3.4.1. In sense of attitude to wild food and traditional medicine

After the conducted interviews and observing the collected information in both regions, the author found out many similarities between these two ethnic groups. The most common mentioned WFP in these two regions were respectively *Rheum spp, Gundelia tuornefortii, Tragopogon pratensis Allium baeticum, Mentha longifolia* which respectively, they are mentioned, 28, 24, 23, 18, and 15 times by the interviewees in both regions. Furthermore, *Allium scorodoprasum, Allium schoenoprasum, Allium jesdianum, Allium ursinum, Thymus vulgaris, Mentha requienii,* are respectively mentioned *13, 13, 11, 11, 10,* and *10* times. However, as it was expected, the local name for most of the mentioned plants in these two regions were slightly different. As an example, in the Mukriyan region, *Rheum spp* is called *"Revas",* while in Hawraman, they call this plant "*Rivav or Rivasi"*. Another example was *Tragopogon pratensis* which is called by three names. In Mukriyan area they were calling it *"Asping",* while in Hawraman, it is called *"Shang, Shing or Shengi"*. However, *"Alaqok or Alakok"* which is folk name for *Tragopogon pratensis,* was called in both of these two regions quite similarly.

The knowledge of these two ethnic groups towards wild plants of their region is stated in Figure 5 based on the interviews, the author observed a significant difference regarding familiarity with wild taxon in each of these two regions. As predicted, both regions had more knowledge about Wild Medicine Plants, as traditionally there are many folk pharmacies and specialists for medical purposes of wild plants. Most of the people had at least an average

knowledge about medical use of wild plants in their surroundings. However, the situation in Hawraman was quite different. Based on the given information by all the informants in Hawraman region, and (Hosseini et al. 2022) they are all followers of "Sheikh Ousman Naqshbandi" a 18th-century influential Sufi, saint, and Islamic scholar, also known as Uthman Siraj-ud-Din at-Tavili or Uthman Siraj-ud-Din al-Awal (b. 1781 AD/c. 1195 AH Tawella, Iraq: d. 1867 AD/c. 1284 AH Tawella, Iraq). The informants were referring to his remained scripts regarding using wild plants in Hawraman region for medical purposes. As a result of these scripts that are now spread, followed and used as an important part of the medical culture in Hawraman region, Marivan city and the surrounding villages, the general knowledge of Hawrami interviewed people was considerably higher than Mukriyan region's informants (H. Algar 2011).

3.4.2. In sense of attitude towards wild plants threats in their region

During the interviews, one of the most important questions the author posed to all of the interviewees was whether or not each plant mentioned posed a threat of extinction or a decreasing trend. The responses of the informants are shown in Table 3. Overall, the author identified three significant threats to wild plants in the Mukriyan and Hawraman regions. Drought, earlier and longer hot periods, the economic situation of the country, and the conversion of wild plants to garden-grown plants. According to given statements of informants in the Mukriyan region, the Iranian labor market is not in a favorable state. Consequently, for economic reasons, many people collect WFPs and Wild medicinal plants in the spring to sell on the local market.

As the number of collectors is considerably high and they also take out the roots of these wild plants while collecting, and as a result the majority of plants with weaker roots are

decreasing every year. The situation in the Hawraman region seems to be very similar, with a gentler slope due to the region's favorable climate. However, similar to Mukriyan, a significant factor in this issue, alongside climate change, is by removing WFPs from their roots in order to plant them in gardens. The local informants, however, noted that by organizing workshops and spreading the words, they are attempting to educate more people on how to properly collect a wild plant and how to form a human chain for the purpose of protecting their environment.

Chapter 4. Limitation

Before concluding this thesis, it is necessary to acknowledge the limitations that have been present throughout the research. Due to living outside of the visited country, the author had a limited amount of time to visit the study areas. Furthermore, due to the author's residence permit in Italy renewing, travel to the studied area was not possible prior to May. As this month is the final month of spring and given the geographical location of Iran and the number of people who collect wild plants, the author was only able to collect a few WFP of which mentioned by the informants in the visited fields. In addition, before traveling to Iran, villages near the border with Iraqi-Kurdistan were selected. Nonetheless, during the scheduling of these visits, the author was advised by knowledgeable individuals that, because the researcher is not affiliated with an Iranian university and is not from the villages in question, there is a risk of getting into trouble by interviewing locals, which could make the revolutionary army members living in those villages suspicious and put the author in danger. These villages were therefore replaced with others that posed a lower risk. In addition, the author intended to have the same number of informants in both Mukriyan and Hawraman regions for a more precise comparison between the two. However, after conducting interviews with the warm and friendly residents of Hawraman Takht and Dezli, all requests to conduct interviews with residents of other nearby villages (specifically in Hajij) were denied, with the exception of one interview in Bolbar and one interview on the roads of the Hajij area.

Chapter 5. Discussion and conclusion

The collected data demonstrate the persistence of an intriguing traditional environmental knowledge (TEK) pertaining to wild vegetables in the study area and identify several unknown or poorly known botanical taxa that are used as wild vegetables. These findings may contribute to a better understanding of the dialectical trajectories of use of wild greens in Mesopotamia and the Middle East from the dawn of agriculture to the present day. The writer believes that linking archaeobotanical and ethnobotanical data could be particularly interesting in Kurdistan, despite the fact that there is still a lack of data from historical or even folkloric sources from past centuries. In addition, we hope that this study will inspire additional field research in surrounding areas and among neighboring populations to determine whether and how TEK practices pertaining to wild vegetables are shared among these diverse socio-ecological environments. The bio-cultural heritage that we documented in East Kurdistan can be further documented and evaluated, despite the fact that this region of the world has been experiencing tragic events for the past few decades and is still home to a number of ethnic and religious groups that coexisted relatively peacefully for centuries. The author hopes that cross-cultural and cross-religious ethnobiology research will help foster initiatives centered on the sustainable use of local natural resources, thereby facilitating mutual recognition and reconciliation processes.

In addition to (Pieroni, Ahmed, and Zahir 2017) statement regarding SE Kurdistan, the author as well suggests that Eastern Kurdistan also could be a significant location for implementing ecotourism, small-scale activities of gathering and/or harvesting local food

plants, and the establishment of local food-based farmers' markets. In these study areas, TEK regarding wild vegetables is still robust and alive, but it is already threatened by the expansion of Western-oriented, industrial food systems. Which many of the informants stated and the author reported in results section. On the other hand, ethnobotanical data in Kurdistan is essential for enhancing health care strategies, as locally collected and consumed wild vegetables are regarded as essential for promoting the well-being of households as a whole. To better assess this potential, the majority of the identified taxa reported in this study require immediate pharmacological and nutraceutical evaluations. As a result of this study, the author believes that it is crucial that human beings live in a harmony with their environment and take good care of it. Moreover, in order to achieve these goals and to have a sustainable wild plant usage culture, and to reduce the speed of deceasing natural resources such as wild plants. Adapting similar cultural educations and information seems to be a very effective way for this matter.

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Annex 1. table 3.

Table 3. List of all reported WFPs by the informants in Hawraman and Mukriyan region.

herbarium specimen code	Family	*latin name*	local name	Culinary Use	Where it grows	Preservation Method
HSK51	Agaricaceae	*Fungi* Unidentified	Qarchek, Karg(mushrooms)	Stew, Cotlet,Soup	High altitudes (and near a plant, called Lo)	No preservation
HSK09	Amaryllidaceae	*Allium jesdianum* Boiss. & Buhse	Qoon soor	Stew, Soup	Hillside	Yellowing
HSK10	Amaryllidaceae	*Allium schoenoprasum* L.	Kuradah	Bread, Mix with Cheese	Hillside, Higher altitudes	No Preservation
HSK12	Amaryllidaceae	*Allium baeticum* Boiss.	Gelakhah	Cotlet, Stew	Hillside, Higher altitudes	Yellowing
HSK28	Amaryllidaceae	*Allium ursinum* L.	Loosha	Soup	Hillside, High altitudes	Yellowing
HSK30	Amaryllidaceae	*Allium vineale* L	Seer chevi	Stew, Soup, Cotlet	High Altitudes	Lactofermented
HSK40	Amaryllidaceae	*Allium scorodoprasumi.*	Pichk (Green Onion or Wild Onion)	Stew, Soup, Cotlet, Greens	Hillside, Riverside	Freezing
HSK48	Amaryllidaceae	*Allium ampeloprasum* L.	Knival	Bread	Hillside, Around river	Freezing
HSK58	Amaryllidaceae	*Allium sativum* L.	Tolakay	Cotlet, Dolmah	Hillside	No preservation
HSK49	Anacardiaceae	*Pistacia atlantica* Desf.	Banah (or Qaswan)	Spice, Cold drink	High Altitudes	Drying, Lactofermented
HSK01	Apiaceae	*Chaerophyllum macrospermum* (Willd. ex Schult.) Fisch. & C.A.Mey. ex Hohen.	Mandok	Pickle, Soup	Hillside	Lactofermented
HSK07	Apiaceae	*Falcaria vulgaris* Bernh.	Qaziakhah	Cotlet	Hillside	Yellowing
HSK35	Apiaceae	*Eryngium Tourn.* ex L.	Tiso	Stew, Snack	Hillside, Riverside, Roadside	Drying
HSK37	Apiaceae	*Pimpinella adscendens* Dalzell	Barazah	Stew, Soup	Hillside, High altitudes	No preservation
HSK44	Apiaceae	*Pimpinella* L.	Harmaley	Infusion	Higher Altitudes	Drying
HSK45	Apiaceae	*Apium graveolens* L.	Kashmah	Stew, Cotlet, Greens	Hillside, High altitudes	Yellowing
HSK46	Apiaceae	*Ferula assa-foetida* L.	Ninor	Spice	Hillside, High altitudes	No preservation
HSK61	Apiaceae	*Prangos ferulacea* (L.) *Lindl.*	Halz	Pickle	Hillside	

herbarium specimen code	Family	Latin name	local name	Culinary Use	Where it grows	Preservation Method
HSK11	Araceae	*Biarum bovei* Blume	Kardoo	Stew, Soup	Hillside, Higher altitudes	Drying
HSK39	Asphodelaceae	*Eremurus spectabilis* M.Bieb.	Khoozhah	Soup	Hillside, High altitudes	Yellowing
HSK53	Asphodelaceae	*Eremurus altaicus* (Pall.) Steven	Paqlachkah	Soup	Higher Altitudes, Hillside	No preservation
HSK02	Asteraceae	*Gundelia tournefortii* L.	Kingr	Stew, Cotlet	Hillside, Higher altitudes	Yellowing
HSK21	Asteraceae	*Tragopogon pratensis* L.	Alaqok (Asping, shang)	Cotlet	High Altitudes	Yellowing
HSK22	Asteraceae	*Calendula officinalis* L.	Hamisha Bahara	Jam	Roadside, Riverside, Hillside	Sugar fermented (Jam)
HSK57	Asteraceae	*Artemisia* L.	Barzalang(Also varkamar)	Infusion	Hillside	Drying
HSK33	Berberidaceae	*Berberis* L.	Zereshk	Stew, Spice	Higher Altitudes	No preservation needed
HSK19	Boraginaceae	*Echium italicum* L	Gozirvan	Infusion, Stew	Hillside, Riversides	Drying
HSK27	Brassicaceae	*Nasturtium officinale* W.T.Aiton	Koozalah	Greens	Hillside, Higher altitudes	No Preservation
HSK29	Brassicaceae	*Descurainia sophia* (L.) Webb ex Prantl	Shivaran	Cold Drink	Hillside, Roadside	Drying
HSK38	Brassicaceae	*Lepidium persicum* Boiss.	Hazbi (Avishan koohi,Hazbah koylah)	Spice, Infusion	Hillside, High altitudes	Drying
HSK41	Brassicaceae	*Lepidium persicum* Boiss.	Roozqah	Stew	Hillside, Roadside	Yellowing
HSK54	Ericaceae	*Vaccinium arctostaphylos* L.	Gableh	Stew	Higher Altitudes	No preservation
HSK20	Fabaceae	*Cicer kermanense* Bornm.	Noka Shoana	Snack, Soup	Hillside	No preservation
HSK23	Iridaceae	*Crocus haussknechtii* (Boiss. & Reut. ex Maw) Boiss.	kifok	Snack, mix with milk	Hillside, High altitudes	No preservation
HSK04	Lamiaceae	*Mentha longifolia* (L.) L.	Pingah	Cotlet, Stew,Soup	Hillside	Taking out the middle of the stem, chopping it then boiling. After boiling, squizing to remove the water and then freezed
HSK06	Lamiaceae	*Salvia bracteata* Banks & Sol.	Prcha-Pirezhna	Stew	Hillside	No Preservation
HSK08	Lamiaceae	*Thymus vulgaris* L.	Jatrah	Spice, Tea	Hillside	Drying
HSK17	Lamiaceae	*Mentha spicata* subsp. Spicata	Nana Chevilka	Spice, Infusion	Hillside	Drying

herbarium specimen code	Family	Latin name	local name	Culinary Use	Where it grows	Preservation Method
HSK24	Lamiaceae	*Stachys lavandulifolia* Vahl	Jia Chay	Infusion	Hillside	No preservation
HSK32	Lamiaceae	*Mentha arvensis* L.	Wild mint(نعناع)	Infusion, Stew, Greens	Hillside, Higher altitudes	Drying
HSK36	Lamiaceae	*Mentha requienii* Benth.	Karas	Spice, Infusion	Hillside, High altitudes	Drying
HSK47	Lamiaceae	*Hyssopus* L.	Zofa	Spice	Hillside, High altitudes	Drying
HSK18	Malvaceae	*Alcea kurdica* (Schltdl.) Alef.	Hero	Jam	Hillside, Riversides	Sugar fermented (Jam)
HSK03	Polygonaceae	*Rheum* spp. *HSK03*	Revas	Snack	Hillside, Higher altitudes	No Preservation for food purposes
HSK26	Polygonaceae	*Rumex acetosa* L.	Tirshoka khasa	Stew, Snack	Riverside only	No preservation
HSK42	Polygonaceae	*Rheum* spp.	Soorah revas	Jam	High Altitudes	Sugar fermented (Jam)
HSK60	Pteridaceae	*Adiantum capillus-veneris* L	Siahpoozeh	Infusion	Hillside	Drying
HSK15	Rosaceae	*Crataegus azarolus* L.	Jevzh	Snack, Fruit	Roadside, Riverside, Hillside	No preservation
HSK16	Rosaceae	*Rosa tomentosa* Sm.	Shilan	Jam	Roadside, Riverside, Hillside	Sugar fermented (Jam)
HSK31	Rosaceae	*Malus domestica* (Suckow) Borkh.	Seva tala	Jam	High Altitudes	Sugar fermented (Jam)
HSK13	Unidentifeid	*Unidentified*	Zizra Mandah	Snack	Roadside, Riverside, Hillside	No Preservation
HSK14	Unidentifeid	*Unidentified*	Biza	Greens, Mix with cheese	High Altitudes	Lactofermented
HSK05	Urticaceae	*Urtica* spp.	Gaz gask	Stew	Hillside	No Preservation for food purposes
HSK43	Violaceae	*Viola cornuta* L.	Vanavsha	Jam	Hillside, Riverside, Roadside	Sugar fermented (Jam)
HSK59	Violaceae	*Viola* L.	Halameh	Stew	Riverside, Roadside, Hillside	Sugar fermented (Jam)
HSK25		Unidentified	Jia Barkhola		Hillside	Unidentifed
HSK34		Unidentified	Gola bagh	Jam	Hillside, Riversides, Roadsides	Sugar fermented (Jam)
HSK50		Unidentified	Khazi	Stew	Hillsides	No Preservation
HSK52		Unidentified	Seyrayan	Stew	Higher Altitudes	No preservation
HSK55		Unidentified	Gzlki	Spice	Hillside	Drying
HSK56		Unidentified	Gnoor	Infusion	Hillside	Drying