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Natural therapies utilisation in Ranya, Kurdistan Region, Iraq

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Abstract: Natural products are an important way to treating the disease in the whole earth. It has been estimated that more than 70% of the earth population relies on natural products. Unfortunately, the knowledge is passed from generation to generation verbally without documentation. The study aims to document the natural therapies used by the Kurdish people in the treatment and management of various ailments. Non-purposive sampling was employed in the study with an in-depth interview guide. One hundred and thirteen respondents were interviewed from the period of September 2021-June 2022. Qualitatively, excel 2016 was used to calculate descriptive statistics of socio-demographic information of the respondents and quantitatively the data were subjected to the following indices: Use Value (UV) and Relative Frequency Citation (RFC). Fourty two medicinal plants were documented and used for the management of various ailments: diabetes, fever, immune booster, aphrodisiac, stomach pain, headache, fungal, and bacterial infections. Leaves were reported as the most used part of the plant (25.5 %), oral as the most form of administration (80.5%). Plants with 0.05 are considered with have the highest UV and 0.8 for RFC. Ranya has a varied range of medicinal plants, according to the current study, and the use of medicinal plants and plant-based therapies is still common in the area. The study aimed to comprehensively document the traditional medicinal plants utilised by the people of Ranya. It will serve as an avenue for further development of herbal formulations and modern medicines in the region.

1. Introduction

There has been a surge of interest in the past few decades in the study of medicinal plants and their traditional use around the world [1]. Finding and learning more about plants that were already being used by local groups was a common goal of ethno botanical research [1]. People have been appealing to the natural environment for relief from a variety of medical ailments throughout recorded history [2, 3].

As conventional medicine expands into new territories, plants remain a novel source of structurally necessary chemicals that help in the development of revolutionary treatments. About half of all pharmaceuticals have their origins in ethno medicine [1]. Even more remarkably, about 25% of today's medications are derived from plants. This provides further evidence that medicines produced from plants are safe and effective [4].

Herbal medicines' growing popularity can be attributed to their lack of minor side effects [5]. Concurrently, the utilization of ethno botanical surveys to collect and document indigenous medicinal plant knowledge is envisioned as a significant tool for identifying potential active principles from the



plant material in the local population [6]. World Health Organization researchers have shown a sharp interest in documenting the traditional uses of therapeutic plants [6].

It has become increasingly fashionable in recent years to investigate medicinal plants and the traditional uses of these plants to improve mainstream treatment. Kurdistan is renowned for its biodiversity and is recognized as a natural repository of indigenous traditions due to the varying physical settings of its area. The objective of this study was to collect and documents information on plants historically used in Ranya for the treatment and management of various diseases.

2. Materials and methods

2.1 Study Area

Ranya can be found at coordinates (36, 28-36, 5) N and (44, 60-44, 33) E longitude and latitude. Lake Dukan Mountains, and other rivers enclose the Ranya District. With a total area of 884 km², the municipality of Ranya is divided into the five districts of Ranya City, Chwarqurna, Hajiawa, Betwata, and Sarkapkan. Annual precipitation averages between 900 and 1,050 mL.

The Mediterranean Sea has a significant impact on each of Ranya four distinct seasons. The summers are hot and dry, while the winters are cold and wet. Ethno botanical research was conducted in Ranya, which is predominantly inhabited by Kurds. Their principal vocations include agriculture, fishing, animal husbandry, government labour, and tourism.

2.2 Sampling and Interview sessions

This study adopted a random sampling methodology. The majority of those interviewed were Traditional Medicine Practitioners, traditional birth attendants, elderly individuals, and apprentices claiming traditional plant knowledge. The interview was performed in the native language using a comprehensive questionnaire as a guide.

2.3 Procedure for Data Collection

During the period of September 2021 to June 2022, in the Ranya community area, data for this study were gathered through direct interviews with residents. The responders' verbal consent was sorted (Figure 1). The significance of the study was communicated to them. If there was a discrepancy between the information given by the respondents, the information was deemed unreliable and disregarded. The area's communicable dialects were used to collect data in accordance with the standard research procedure.

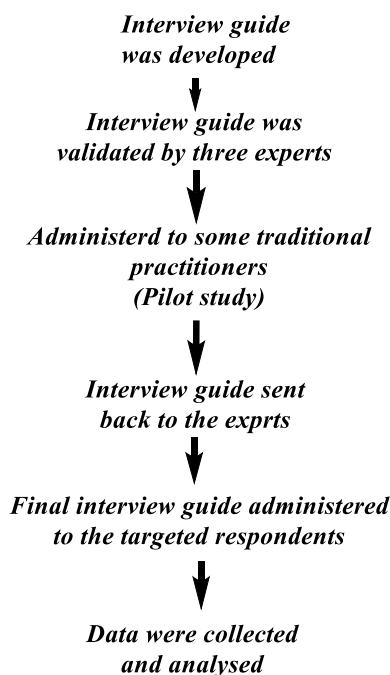


Figure 1. Flow chart of the methodology (Source author)

2.4 Plants Collection and Identification

The available plant species documented during the interview were collected individually in the field with the assistance of respondents, as validated by the certified taxonomist in the Biology Department at Tishk International University. The avoidance of plant species with varying local names. World Flora Online, an online database, was utilized to double-check the names' authenticity. <http://www.worldfloraonline.org/>.

2.5 Data analysis

The frequency and proportion of the acquired ethno botanical data were determined using a simple descriptive analysis.

- i. Respondent socio-demographic information, plant taxonomic information, administration method, preparation method, growth forms, and plant components using excel 2016.
- ii. Using the following indexes, quantitative data were calculated:
 - a. The following formula employed used to rank the relative significance of different plant species: $UV = \sum U_i / N$: Where U_i represents the total number of users mentioned and N represents the total number of informants questioned in this study.
 - b. To estimate the popularity of medicinal plant species, the relative frequency of citation (RFC) method was applied. The above attribute was used to assess the plant's popularity in the community. $RFC = F_c / N$, where F_c is the number of respondents who cited a certain plant species and N represents the total number of respondents interviewed.

3. Results and Discussion

3.1 Demographic profile

Indigenous peoples all across the world drank traditional foods, herbal juice, herbal teas, and other liquids made from medicinal plants. Drugs are frequently found by studying medicinal plants [7]. There were 113 respondents total, with males making up 52.2% and women 47.8% (Table 1). This is because cultural norms are often exclusively open to some women and only on special occasions. The vast majority of women were forbidden from communicating with males from other communities. Therefore,

women's participation in documenting ethno botanical knowledge was limited. The study found that both men and women who participated in the current study had in-depth knowledge of their cultural traditions. Most of the sources were between the ages of 46 and 55. (40.7 %) (Table 1). However, more experienced informants have a wealth of unique indigenous knowledge. There was a disproportionate number of interviewees who had no western-style education (28.3 %) (Table 1). It was thought that Western education was unnecessary for traditional jobs [5]. Respondents play a significant role in ethno botanical investigations. Their age, gender, level of education, occupation, and religion, among other factors, give us insight into the survey and make it easier to analyze and comprehend the data by putting it in the right social context [8].

Table 1. Demographic profile of the informants

Parameters	Frequency	Percentage %
Gender		
Men	59	52.2
Women	54	47.8
Age		
35-45	17	15.0
46-55	31	27.4
56-65	46	40.7
66>	19	16.8
Education		
Primary School	31	27.4
High School	20	17.7
Tertiary	30	26.5
None	32	28.3

3.2 Diversity of plants

The goal of the current investigation was to compile a list of medicinal plant species used to treat and manage various ailments. Maintaining a wide variety of plant species is crucial since they contribute so many effective, non-invasive treatments to modern medicine. Thirty families were represented by their 42 respective plant species in this study. Lauraceae, Rosaceae, and Zingiberaceae (7.1% each; Figure 2, Table 2). Fagaceae, Apiaceae, Fabaceae, Lamiaceae, Moraceae, and Solanaceae (4.8% each; Figure 2, Table 2). The remaining plant families were represented by only 2.4 % each (Figure 2). Diverse ailments were treated with these plant species. Many different illnesses, including common cold, fever, improved digestive health, diabetes, women's cy, cancer, peptic ulcer disease, and many others, were treated using the documented plants, as reported by the respondents (Table 3).

During the research, it was revealed that the residents of Ranya were diligent guardians of their traditional knowledge of medicinal plants and utilised to improve their health status. The findings agree with the previous reports [9, 10]. Variety of plants is found in the research region which is indicative of the area's bio-diverse flora. The widespread use of medicinal plant species from these families may be the primary source of diverse active phytochemicals.

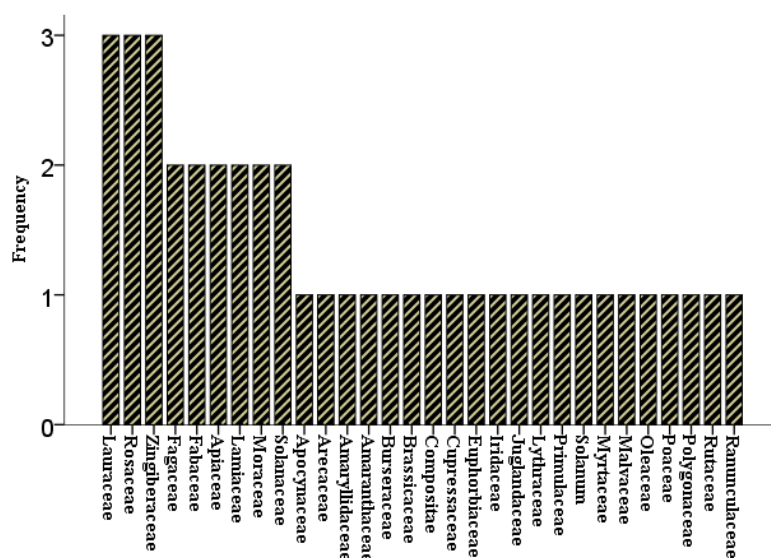


Figure 2. Family distribution of medicinal plants in Ranya community

Table 2. Taxonomic description of documented plants

S/N	Family	Science name	KN
1	Apiaceae	<i>Pimpinella anisoides</i> V.Brigr.	رہزیانہ
2	Apiaceae	<i>Apium annuum</i> P.S. Short	کمرہوز
3	Apocynaceae	<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	قینہنفر
4	Arecaceae	<i>Cocos nucifera</i> L -3	گوئز ہیندی
5	Amaryllidaceae	<i>Allium sativum</i> L.	سبیر
6	Amaranthaceae	<i>Beta vulgaris</i> L.	سلق
7	Burseraceae	<i>Commiphora myrrha</i> (Nees) Engl.	بنیشتہ تال
8	Brassicaceae	<i>Nasturtium officinale</i> R.Br.	کوزملہ
9	Compositae	<i>Chamaemelum fuscatum</i> (Brot.) Vasc.	گولہ حاجیلہ
10	Cupressaceae	<i>Juniperus communis</i> L	سنو بیہر
11	Euphorbiaceae	<i>Ricinus communis</i> L.	توو گسر چہک
12	Fagaceae	<i>Quercus acerifolia</i> (E.J. Palmer) Stoyhoff & Hess	مازو
13	Fagaceae	<i>Quercus acutangula</i> Trel.	بہروو
14	Iridaceae	<i>Crocus sativus</i> L.	زہ عفران
15	Juglandaceae	<i>Juglans regia</i> L.	گونز
16	Lythraceae	<i>Punica granatum</i> L.	ہمنار
17	Lauraceae	<i>Persea americana</i> Mill.	نہفؤگادرؤ
18	Lauraceae	<i>Cinnamomum alainii</i> (C.K. Allen) Alain	دار چین
19	Lauraceae	<i>Laurus nobilis</i> L.	گہ لای غار
20	Lamiaceae	<i>Mentha alaica</i> Boriss.	ریحان
21	Lamiaceae	<i>Satureja hortensis</i> L.	جائزہ
22	Fabaceae	<i>Trigonella foenum-graecum</i> L.	شملی
23	Fabaceae	<i>Vigna radiata</i> (L.) R. Wilczek	ماش
24	Primulaceae	<i>Primula veris</i> L.	گولی ہمیشہ بہ ہار
25	Solanum	<i>Solanum scuticum</i> M. Nee	تولہکے

26	Myrtaceae	<i>Eucalyptus absita</i> Grayling & Brooker	قلمه متوز (كاليك توز)
27	Malvaceae	<i>Malva neglecta</i> Wallr.	گولّه هنرؤ
28	Moraceae	<i>Morus alba</i> L.	توی وشك
29	Moraceae	<i>Ficus carica</i> L.	ههنجیری وشکراو
30	Oleaceae	<i>Olea europaea</i> L.	زهیتون
31	Poaceae	<i>Avena abyssinica</i> Hochst.	شووفان
32	Polygonaceae	<i>Rumex acetosa</i> L.	ترشوکه
33	Rosaceae	<i>Rosa × damascena</i> Herrm.	گول
34	Rosaceae	<i>Crataegus aestivalis</i> (Walter) Torr. & A. Gray	گنوژ
35	Rosaceae	<i>Prunus cerasus</i> L.	باله لوک
36	Rutaceae	<i>Citrus × aurantium</i> L.	لیمو بهسرای
37	Ranunculaceae	<i>Nigella sativa</i> L.	رمشکه
38	Solanaceae	<i>Petunia altiplana</i> T. Ando & Hashim.	ونهوشه
39	Solanaceae	<i>Solanum etuberosum</i> Lindl.	پهتاته
40	Zingiberaceae	<i>Curcuma longa</i> L.	زهرده چهوه
41	Zingiberaceae	<i>Elettaria cardamomum</i> (L.) Maton	گیای سولتانان
42	Zingiberaceae	<i>Zingiber officinale</i> Roscoe	زهنجهفیل

Note: S/N = Serial Number, KN = Kurdish Name

Table 3. Parts, method of preparation, administration method and diseases treated with the documented plants

S/N	Science name	PPU	MP	MA	Disease
1	<i>Pimpinella anisoides</i> V.Brig.	Seed	Place 1 teaspoon of seed in to one cup of warm Water, shake well, and leave it for 20 minutes to rest.	Oral	Stomach disease
2	<i>Apium annuum</i> P.S. Short	Stem, leaves	Boiling with water then using the water as a medicine	Oral	Anti-Cancer, Lower blood pressure
3	<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	Flower	Add 1 teaspoon of dried flower into 1 cup of warm water, leave it for 15 minutes, and drink once a day before or after meal.	Oral	Protect the liver. Stomach health. Immune booster
4	<i>Cocos nucifera</i> L -3	Fruit	Eating directly	Oral-Dermal	Hair loss. Skin diseases. Breathing problems.
5	<i>Allium sativum</i> L.	Bulb	Crush 1 tablespoon, add 2 cups of water, put it on a low heat for 5 minutes,	Oral	Prevent heart disease. Lower cholesterol. Fight

					cancer. Lower blood sugar level.
6	<i>Beta vulgaris</i> L.	Seed, Leaves	Boiled with water and drink in the morning once every 4 nights	Oral	Improved blood circulation. Control blood pressure
7	<i>Commiphora myrrha</i> (Nees) Engl.	leaves	Cup of warm water, leave it for 15 minutes, and drink once a day before or after meal.	Oral-Dermal	Stomach infection. Skin diseases
8	<i>Nasturtium officinale</i> R.Br.	Bark, Leaves	Eating directly	Oral	Lower blood pressure. Help in pregnancy
9	<i>Chamaemelum fuscatum</i> (Brot.) Vasc.	Flower	Place some of flower to one Cup of warm water.	Oral	Improve skin health. Treats stomach cramp
10	<i>Juniperus communis</i> L.	Fruit	Boiled with water and take one cup every morning.	Oral-Dermal	Improve blood circulation. Improve immune system
11	<i>Ricinus communis</i> L.	Seed, fruits	One tablespoon of powder with boiled water for 10 minutes, then add 1 lemon and 1/2 teaspoon salt.	Oral-Dermal	Eye lash. Faecal impaction.
12	<i>Quercus acerifolia</i> (E.J. Palmer) Stoyloff & Hess	Fruit	Make the fruits like spice and then mix with boiled water.	Oral	Wound healing
13	<i>Quercus acutangula</i> Trel.	Fruit	Make the fruit into small pieces and then add to milked.	Oral	Diarrhea. Corona virus.
14	<i>Crocus sativus</i> L.	Flower	Add powder to the meal	Oral	Eye treatment. Wounds.
15	<i>Juglans regia</i> L.	Fruits	Eating directly	Oral	Improved heart function. Help regulate sleep.
16	<i>Punica granatum</i> L.	Bark	Dried the fruit then mix with water.	Oral	Stomach.
17	<i>Persea americana</i> Mill.	Leaves, Flower, Bark	Decoction of any parts of the plant, and take morning before meal	Oral-Dermal	Contain a rich nutrient profile. Help manage stress.
18	<i>Cinnamomum alainii</i> (C.K. Allen) Alain	Fruits	Make the fruits like spice then mix with honey	Oral	Throat
19	<i>Laurus nobilis</i> L.	Leaves	Boiling the leaf with water and then drinking water.	Oral	Headache. Weakness.

20	<i>Mentha alaiica</i> Boriss.	Leave s, stem	Add the leaf in to boiled water, then drinking water alone.	Oral	Heartburn. Stomach disease.
21	<i>Satureja</i> <i>hortensis</i> L.	Leave s	Place one spoon of summer savory to warm water	Oral	Stomach ulcer
22	<i>Trigonella</i> <i>foenum-graecum</i> L.	Seed	place one teaspoon of seed with one cup of warm water the add oil	Oral	Help prevent cardiovascular disease.
23	<i>Vigna radiata</i> (L.) R. Wilczek	Seed	Boiled with water	Oral	Control diabetes
24	<i>Primula veris</i> L.	Flowe r	Place 1 teaspoon of dried plant in to one cup of warm water, shake well, leave it for 15 minutes to rest.	Oral	Infection of ears
25	<i>Solanum</i> <i>scuticum</i> M. Nee	Leave s, Stem	Put the leaf and stem in to boiled water, shake well	Oral	Lungs infection. Women cycle.
26	<i>Eucalyptus absita</i> Grayling & Brooker	Leave s	Put some leaves in to warm water and then smell the mixture.	Dermal	Cold. Fever
27	<i>Malva neglecta</i> Wallr.	Flowe r	Put to the one cup of warm water, shake well, Leave for 30 minutes	Oral	Improve digestive health.
28	<i>Morus alba</i> L.	Fruit	Eating directly.	Oral	Women cy
29	<i>Ficus carica</i> L.	Fruit	Boiled the dehydrate fig with water and then add olive oil.	Dermal	Promotes bone density. Heals sore throat
30	<i>Olea europaea</i> L	Leave s	Eating directly	Oral	Heart healthy
31	<i>Avena abyssinica</i> Hochst.	Seed	Mix with milk and drink every morning and evening.	Oral	Reduce blood pressure. Prevent Liver problem
32	<i>Rumex acetosa</i> L.	Leave s	Infusion of the leaves and drink morning and night.	Oral	Lower fat
33	<i>Rosa</i> × <i>damascena</i> Herrm.	Flowe r	Decoction	Oral	Prevent infection
34	<i>Crataegus</i> <i>aestivalis</i> (Walter) Torr. & A. Gray	Fruit	Eating directly	Oral	Maintains blood pressure levels. Reduced cholesterol
35	<i>Prunus cerasus</i> L.	Fruit	Place 1 tablespoon of dried fruits in hot water and boil it for 10 minutes, let it seep	Oral	Reduces risk of heart diseases.

36	<i>Citrus × aurantium L.</i>	Fruit	for 3-5 minutes, strain, and drink it. Place 1 teaspoon dried leaves into the cup of boiled water and then leave it to rest for 15 minutes, strain add honey and lemon.	Oral	Digestive system. Help loss weight.
37	<i>Nigella sativa L.</i>	Seed	Place one teaspoon of seed with some amount of honey.	Oral	Reduce blood pressure. Prevent Liver problem.
38	<i>Petunia altiplana</i> T. Ando & Hashim.	Flower	Boiling the flower with water then drinking just the water.	Oral	Reduces risk of heart diseases.
39	<i>Solanum tuberosum</i> Lindl.	Stem	Drinking the water of potato.	Oral	Stomach disease Ulcer
40	<i>Curcuma longa</i> L.	Root	Spice of plant mix with olive oil then use for face	Dermal	Skin diseases
41	<i>Elettaria cardamomum</i> (L.) Maton	Leaves	Boiled with water.	Oral	Improves blood circulation
42	<i>Zingiber officinale</i> Roscoe	Root	Place some Ginger to water then add honey.	Oral	Treat Diarrhea. Prevent cancer.

Note: S/N = Serial Number, PPU = Parts of the Plant Used, MP = Method of Preparations, MA = Method of Administration

3.3 Parts used, preparation, and administration

Chemical compounds of various kinds are said to accumulate in plant tissues. Bioactive substances found in most parts of medicinal plants have direct or indirect therapeutic effects [11]. It was discovered that several plant parts were used in conventional medicine [11]. Leaves, fruits, seeds, flowers, stems, bark, roots, and bulbs were all utilized to treat various medical conditions in Ranya. Leaves were the dominant utilised plant part (25.49%), fruits (25.53%), and the least bulb (1.96%) (Figure 3). The leaves of plants are highly prized in traditional medicine due to the abundance of medicinal compounds they contain [12]. Because of the likely presence of active compounds [13]. The usage of leaves and other aerial components of plants does not threaten their viability in the wild [14]. However, this study indicated that leaves were the most often used portion of the plant, maybe because they were the most accessible and had the highest chemical concentration. Population growth and the spread of farming pose a serious threat to medicinal plants [14].

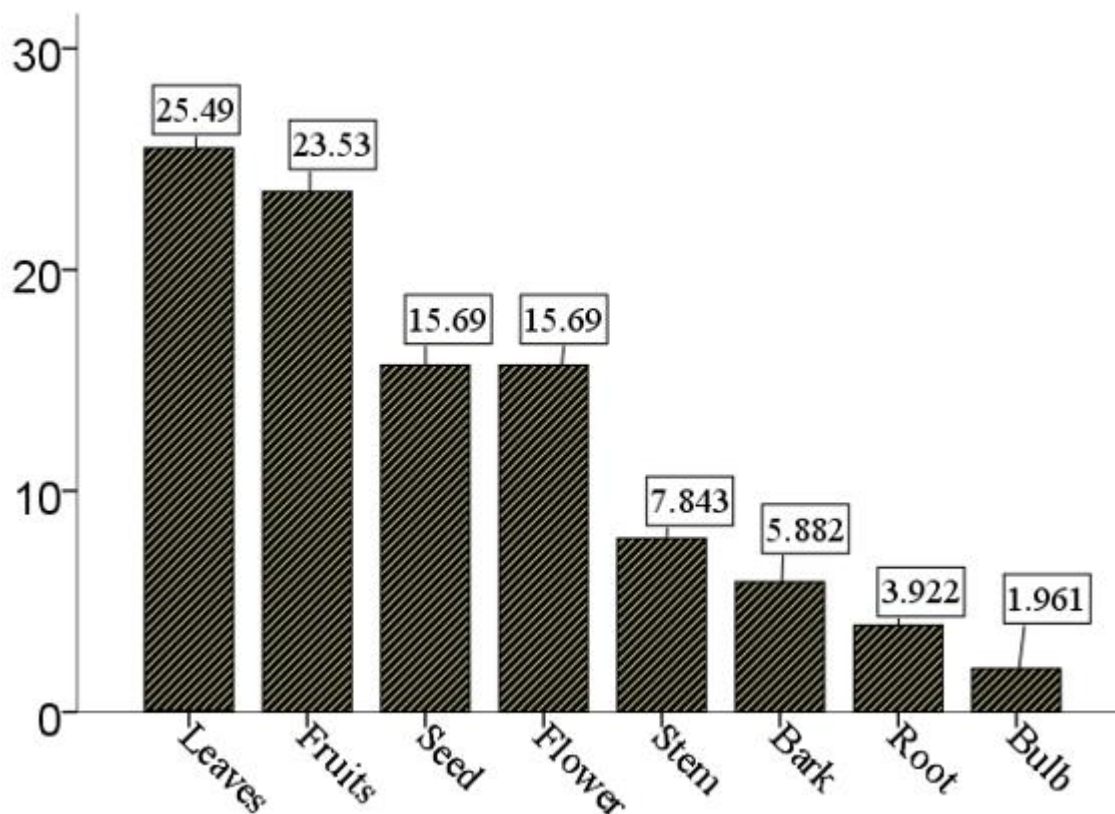


Figure 3. Utilised plant parts in %

The majority (80.49%) of medicinal plant preparations were taken orally, oral-dermal application (12.20%) with the remaining 7.31 % being applied dermally (Figure 4). Previous research was established; oral application is the most popular method of administration of medicinal plants [11, 12, 15]. However, the rapid physiological action and increased curative efficacy of medicinal plant preparations are possible via both oral and dermal routes. Most remedies consist of a combination of many plant species, plus additional ingredients like honey, milk, and water.

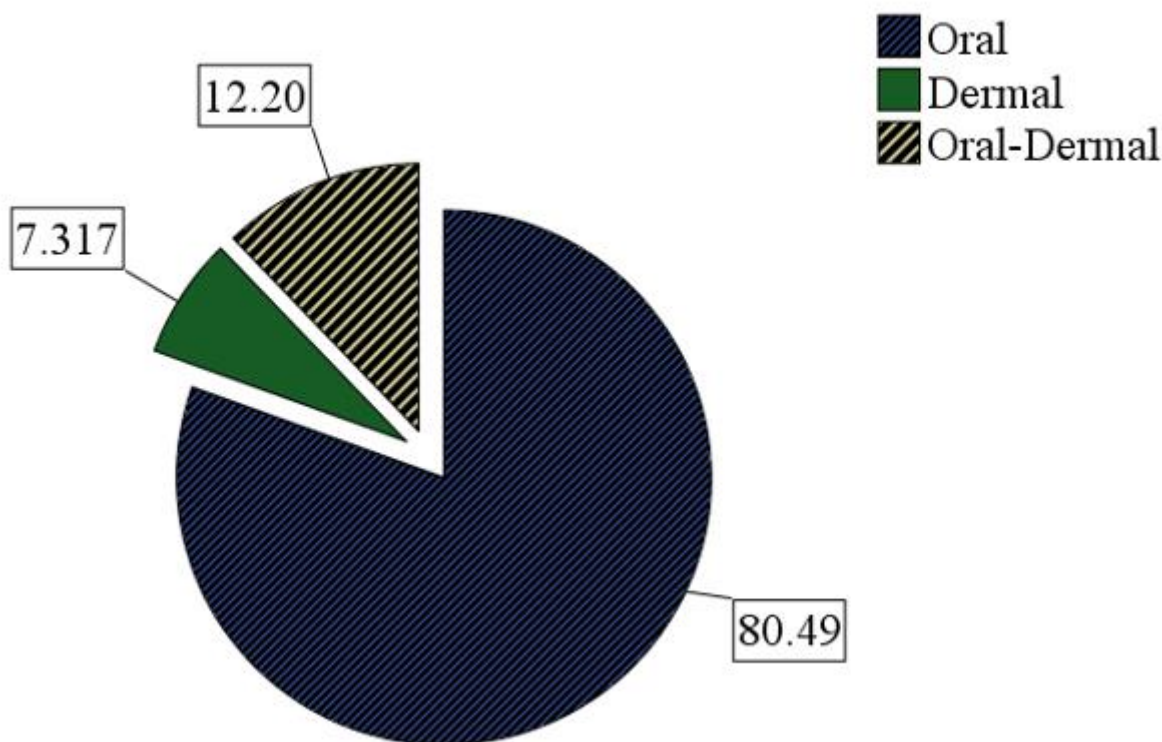


Figure 4. Route of administration of the documented medicinal plants in %

3.4 Quantitative evaluations

Efforts have been made in recent years to improve the conventional compilation-style approach to ethno botanical research by including appropriate quantitative tools to increase the studies' predictive power [6, 16, 17]. In the following research, quantitative indices were used to measure the usefulness of the documented plants in the treatment and management of various diseases in the study area. All described plants were quite helpful and were used by respondents for well-being. High Used value (UV) and Relative Frequency citations (RFC) value was recorded (Table 4). *Nasturtium officinale* has the highest RFC at 0.9, followed by *Rumex acetosa*, *Trigonella foenum graecum*, *Allium sativum*, *Quercus acerifolia* and *Juglans regia* 0.8 % respectively. As reported previously, plants with high fidelity values are good indicators of containing compounds with high medicinal value [9, 11, 18, 19]. The following plants can be fully utilised to produce herbal medicines and in the pharmaceutical industry for the treatment and management of documented ailments.

Table 4. Quantitative evaluations

S/N	Science name	UV	RFC %
1	<i>Pimpinella anisoides</i> V.Brig.	0.03	0.7
2	<i>Apium annuum</i> P.S. Short	0.05	0.6
3	<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	0.03	0.5
4	<i>Cocos nucifera</i> L -3	0.03	0.7
5	<i>Allium sativum</i> L.	0.03	0.8
6	<i>Beta vulgaris</i> L.	0.05	0.5
7	<i>Commiphora myrrha</i> (Nees) Engl.	0.04	0.4
8	<i>Nasturtium officinale</i> R.Br.	0.02	0.9

9	<i>Chamaemelum fuscatum</i> (Brot.) Vasc.	0.03	0.4
10	<i>Juniperus communis</i> L.	0.05	0.4
11	<i>Ricinus communis</i> L.	0.03	0.7
12	<i>Quercus acerifolia</i> (E.J. Palmer) Stoyhoff & Hess	0.04	0.8
13	<i>Quercus acutangula</i> Trel.	0.05	0.5
14	<i>Crocus sativus</i> L.	0,03	0.4
15	<i>Juglans regia</i> L.	0.02	0.8
16	<i>Punica granatum</i> L.	0.03	0.4
17	<i>Persea americana</i> Mill.	0.05	0.6
18	<i>Cinnamomum alainii</i> (C.K. Allen) Alain	0.02	0.4
19	<i>Laurus nobilis</i> L.	0.05	0.4
20	<i>Mentha alaica</i> Boriss.	0.03	0.4
21	<i>Satureja hortensis</i> L.	0.02	0.6
22	<i>Trigonella foenum-graecum</i> L.	0.02	0.8
23	<i>Vigna radiata</i> (L.) R. Wilczek	0.02	0.7
24	<i>Primula veris</i> L.	0.03	0.6
25	<i>Solanum scuticum</i> M. Nee	0.04	0.5
26	<i>Eucalyptus absita</i> Grayling & Brooker	0.03	0.4
27	<i>Malva neglecta</i> Wallr.	0.05	0.6
28	<i>Morus alba</i> L.	0.02	0.5
29	<i>Ficus carica</i> L.	0.04	0.8
30	<i>Olea europaea</i> L.	0.02	0.7
31	<i>Avena abyssinica</i> Hochst.	0.03	0.4
32	<i>Rumex acetosa</i> L.	0.02	0.8
33	<i>Rosa × damascena</i> Herrm.	0.03	0.4
34	<i>Crataegus aestivalis</i> (Walter) Torr. & A. Gray	0.04	0.6
35	<i>Prunus cerasus</i> L.	0.02	0.5
36	<i>Citrus × aurantium</i> L.	0.03	0.7
37	<i>Nigella sativa</i> L.	0.02	0.4
38	<i>Petunia altiplana</i> T. Ando & Hashim.	0.05	0.6
39	<i>Solanum etuberosum</i> Lindl.	0.04	0.5
40	<i>Curcuma longa</i> L.	0.02	0.8
41	<i>Elettaria cardamomum</i> (L.) Maton	0.03	0.5
42	<i>Zingiber officinale</i> Roscoe	0.05	0.7

Note: S/N = Serial Number, UV = Used Value, RFC = Relative Frequency Citations

4. Conclusion

According to this study, the study area has a rich diversity of native medicinal plant species and related traditional knowledge. Since this knowledge has been passed down from generation to generation, there is an urgent need to preserve it because the current generation is not giving it any thought. The people who live in the study area have a long and storied history of using medicinal plants, as evidenced by the results of the present investigation. Diversity in the area's flora is largely responsible for the high level of ethno botanical wealth discovered there. According to this study, plants continue to be an important source of medications for the prevention, diagnosis, and treatment of numerous diseases in society. In this study, medicinal plants with high UV and RFC should be assessed for pharmacological research on

useful phytochemical compounds, and it is necessary to synthesize novel potential drugs for a range of illnesses.

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