

# Quantitative ethnobotanical assessment of medicinal plants in Zagatala District, Azerbaijan

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**Abstract.** *Isayev JI, Jafarova GS, Safarova NM, Hajiyeva EM. 2026. Quantitative ethnobotanical assessment of medicinal plants in Zagatala District, Azerbaijan. Biodiversitas 27 (3): d270309. <https://doi.org/10.13057/biodiv/d270309>.* This cross-sectional ethnobotanical study, conducted between 2023 and 2025, provides a quantitative assessment of medicinal plants traditionally used by the multi-ethnic communities of the Zagatala District in northwestern Azerbaijan. Ethnomedicinal knowledge was documented through structured and semi-structured interviews with 105 informants, recording 121 medicinal plant taxa belonging to 115 genera and 44 families. Quantitative ethnobotanical indices - including Use Value, Relative Frequency of Citation, Fidelity Level, Family Importance Value, and Informant Consensus Factor (UV, RFC, FL, FIV, and ICF) - were applied to assess cultural significance and knowledge consensus. The highest UV values were recorded for *Crataegus orientalis* (0.76), followed by *Thymus caucasicus* (0.74) and *Cydonia oblonga* (0.73). Species with high RFC values, such as *Rosa tomentosa* (RFC = 0.96), *T. caucasicus* (0.96), and *Alcea rugosa* (0.94), were the most frequently cited by informants. ICF values were high across all ailment categories (0.94-1.00), with particularly strong consensus for laxative uses (ICF = 0.98), cardiovascular disorders (0.98), and broncholytic uses (0.99). These findings document the rich ethnomedicinal heritage of the region and identify *C. orientalis*, *T. caucasicus*, and *C. oblonga* as culturally prominent species that merit further phytochemical and pharmacological investigation, while emphasizing the importance of preserving traditional knowledge and supporting sustainable management of local plant diversity. This study provides a quantitative baseline for future pharmacological validation, conservation planning, and sustainable management of medicinal plant resources in Azerbaijan and the wider Caucasus region.

**Keywords:** Azerbaijan, Caucasus, ethnomedicine, Informant Consensus Factor, quantitative ethnobotany

## INTRODUCTION

Azerbaijan, located within the Caucasus biodiversity hotspot, is home to more than 5,000 vascular plant species, representing nearly 70% of the entire Caucasus flora (Karyagin 1957; Damirov et al. 1983). Despite this botanical wealth, ethnobotanical research across the country remains limited and uneven, with only a few systematic studies reported in recent decades (Mamedov et al. 2015; Ibadullayeva et al. 2016; Ozturk et al. 2018; Isayev et al. 2024a,b; Isayev et al. 2025). This gap is particularly evident in the Zagatala District, where plant-based traditional practices are deeply rooted in local culture.

International ethnobotanical studies underline the importance of medicinal plants in traditional healthcare systems worldwide (Silalahi and Nisyawati 2018; Ayub et al. 2023; Rehman et al. 2023; Bi et al. 2024; Paraguison et al. 2024; Mogha 2024; Dewi et al. 2024; Albar et al. 2025). In recent decades, the discovery of new natural compounds from ethnomedicinal plants has further increased scientific interest in traditional knowledge (De La Cruz-Jiménez et al. 2022). Ethnomedicine, which explores traditional therapeutic practices, provides insight into the cultural significance and practical applications of medicinal species (Bassa 2017). However, patterns of plant use vary across cultural and ecological contexts, highlighting the need for

district-level, region-specific documentation in multi-ethnic areas.

In line with this perspective, similar ethnobotanical research conducted in the Caucasus region underscores the richness of traditional plant knowledge (Bussmann et al. 2016; Bussmann et al. 2018; Söukand and Pieroni 2019). In Azerbaijan, more than 1,500 wild and cultivated species are used for medicinal and household purposes. Recent studies by researchers from Azerbaijan Medical University and other institutions have shown the significant bioactive potential of local flora (Olennikov et al. 2019; Kashchenko et al. 2022; Olennikov et al. 2022; Babayeva et al. 2025; Jafarova et al. 2025; Olennikov et al. 2025), further highlighting the value of documenting indigenous plant use.

In this broader ethnomedicinal context, the Zagatala District is particularly known for its long-standing traditions of wild plant use in folk healthcare. Zagatala represents a unique ecological zone, characterized by mountainous terrain, variable microclimates, and relatively undisturbed natural habitats. The district is inhabited by Azerbaijanis, Avars, Lezgins, Tsakhurs, and other ethnic minorities who maintain distinct traditions of herbal medicine (Haq et al. 2022). Many households still rely on wild and cultivated medicinal plants for primary healthcare. Such long-standing interactions between local communities

and their natural environment reinforce the region's suitability for ethnobotanical investigation.

Despite this continuity, traditional ethnomedicinal knowledge in the Zagatala District is increasingly at risk, as younger generations show reduced interest due to modernization and shifting cultural practices. In this setting, traditional medicinal practices are transmitted across generations and are supported by accumulated knowledge of safety and perceived effectiveness (Ayoubi et al. 2024). This has increased interest in documenting community-based ethnomedicinal knowledge (Phengmala et al. 2024). In addition, such ethnobotanical research supports phytotherapeutic development and the preservation of culturally significant plant resources (WHO 2019; Muanga et al. 2024).

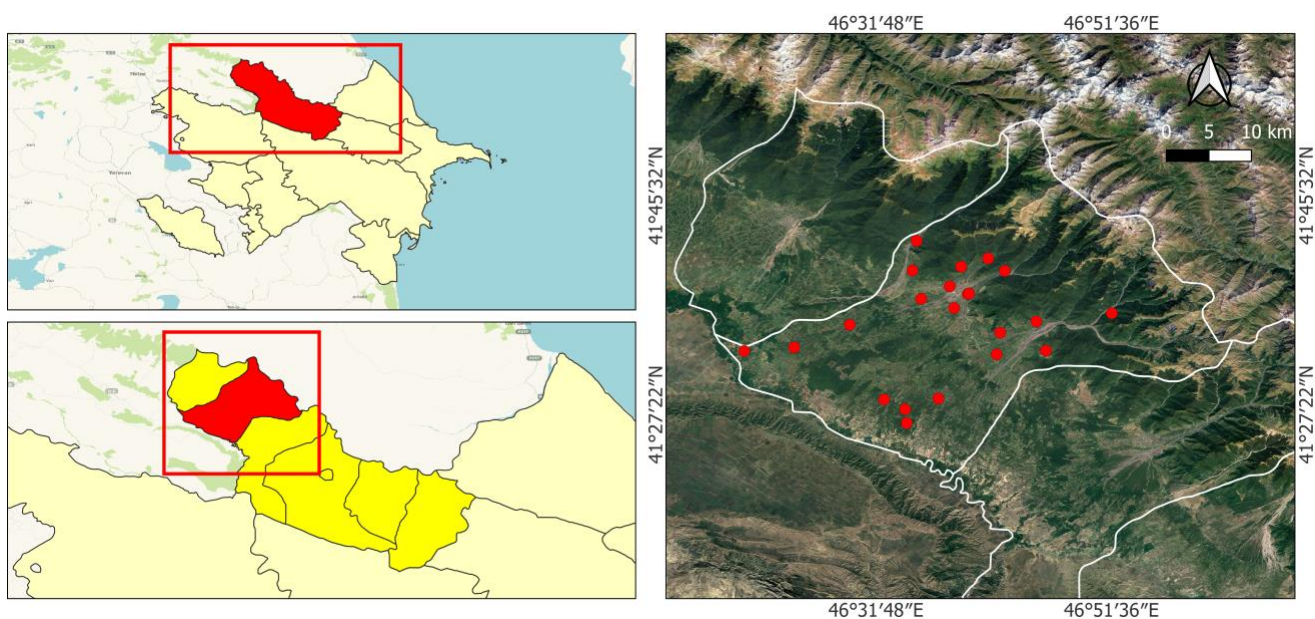
However, ethnobotanical knowledge in the Zagatala District has not been systematically examined using standardized quantitative approaches. Existing information is largely descriptive and based on oral accounts, and quantitative ethnobotanical indices have rarely been applied, particularly within multi-ethnic communities. Consequently, the relative cultural importance of medicinal plant species and the level of informant consensus remain insufficiently evaluated. To address these gaps, the present study applies several widely used quantitative ethnobotanical indices – including Use Value (UV), Relative Frequency of Citation (RFC), Fidelity Level (FL), Informant Consensus Factor (ICF), and Family Importance Value (FIV) – to systematically evaluate traditional medicinal plant use in the multi-ethnic Zagatala District. Based on this rationale, the present study formulates the following hypothesis: Quantitative ethnobotanical indices (UV, RFC, FL, ICF, and FIV) can help identify culturally salient medicinal plant species within the Zagatala District. By integrating qualitative ethnomedicinal knowledge with standardized quantitative analysis, this study advances regional

ethnobotanical research beyond earlier narrative-based approaches. It provides a framework for cross-regional comparison and research prioritization. Accordingly, the present study aims to: (i) document the diversity of medicinal plants traditionally used by the inhabitants of the Zagatala District; (ii) classify their uses across ailment categories, plant parts, and preparation methods; (iii) quantify the cultural importance and informant agreement using standard ethnobotanical indices (UV, RFC, FL, ICF, FIV); and (iv) identify and prioritize culturally significant species based on quantitative indices for future phytochemical research and conservation planning.

## MATERIALS AND METHODS

### Study area

The Zagatala District is located in northwestern Azerbaijan, on the southern slopes of the Greater Caucasus mountain range. The region is predominantly mountainous, with elevations generally ranging from 300 to 900 m above sea level and a moderately humid climate that supports diverse vegetation types. Fieldwork was conducted between 2023 and 2025 in 22 settlements of the Zagatala District (Figure 1). A detailed list of the surveyed villages, including altitude and geographical coordinates, is provided in Table 1. These settlements were selected to reflect variation in elevation, habitat conditions, and ethnic composition across the district, thereby capturing ecological and cultural diversity within the Zagatala District. Zagatala is inhabited by Azerbaijanis, Avars, Lezgins, Tsakhurs, and other ethnic communities whose long-standing cultural traditions and reliance on wild and cultivated plants make the region particularly suitable for ethnobotanical investigation.



**Figure 1.** Locations of ethnobotanical surveys conducted in the Zagatala District, Shaki-Zaqatala, Azerbaijan

**Table 1.** Villages surveyed during ethnobotanical research in the Zagatala District, Azerbaijan

Village name	Geographical coordinates	Altitude (m asl)
Ahakh dara	41°39'38" N, 46°38'58" E	890
Ashaghy Chardakhlar	41°32'38" N, 46°20'43" E	250
Ashaghy Tala	41°36'12" N, 46°38'22" E	455
Jar	41°40'19" N, 46°41'14" E	750
Jimjimakh	41°35'46" N, 46°51'38" E	218
Chobankol	41°32'22" N, 46°41'57" E	203
Danachi	41°32'56" N, 46°24'55" E	210
Goyam	41°36'58" N, 46°35'36" E	407
Aliabad	41°28'42" N, 46°37'03" E	262
Hoytala	41°34'49" N, 46°29'36" E	874
Kebeloba	41°38'00" N, 46°38'00" E	562
Gandakh	41°28'37" N, 46°32'29" E	219
Qabizdara	41°41'46" N, 46°35'13" E	506
Mamruk	41°32'40" N, 46°46'05" E	519
Mazikh	41°39'19" N, 46°34'52" E	437
Mishlesh	41°39'17" N, 46°42'38" E	612
Mosul	41°26'40" N, 46°34'23" E	210
Mukhakh	41°34'09" N, 46°42'15" E	463
Parzivan	41°37'22" N, 46°39'31" E	564
Yengiyar	41°27'49" N, 46°34'15" E	328
Yukhary Chardakhlar	41°35'05" N, 46°45'17" E	786
Yukhary Tala	41°37'24" N, 46°39'38" E	450

### Sampling strategy and informant selection

A purposive sampling strategy was used to identify initial knowledgeable informants based on recommendations from local community leaders, elders, and municipal representatives. This was followed by snowball sampling, in which each participant referred additional individuals recognized for their traditional plant knowledge. Sampling continued until data saturation was reached, defined as the point at which no new plant species or use reports were identified in the final interviews. In total, 105 informants (31 women and 74 men, aged 28-92 years) were interviewed, representing all major ethnic groups in the district. The higher proportion of male informants reflects local sociocultural norms that may influence access to traditional knowledge holders in the study area. The final sample included both traditional plant healers and knowledgeable lay community members, reflecting the diversity of ethnomedicinal knowledge holders in the study area. Only individual interviews were conducted to avoid mutual influence among respondents.

### Fieldwork

Fieldwork was carried out during multiple visits across different seasons between 2023 and 2025 to ensure the documentation of seasonal plant availability and traditional uses. Surveys were performed in cultivated fields, forested areas, pastures, and household gardens, accompanied by local residents who demonstrated plant collection practices and described preparation methods.

### Data collection

Ethnobotanical information was collected through face-to-face interviews, semi-structured questionnaires, and open-

ended discussions. The questionnaire was designed following established ethnobotanical research guidelines (Martin 1995; Alexiades 1996) and was further informed by recent methodological approaches (Luo et al. 2024). It included questions on local plant names, parts used, preparation and administration methods, traditional recipes, and medicinal applications. Each plant species was assigned a voucher number (e.g., AZE-IJ-001). Use-reports were coded using standardized categorical codes representing ailment category (A1-A43), plant part (P1-P11), and preparation method (M1-M9). Respondents were anonymized using numerical identifiers (R1-R105). In this study, the plant part category "whole herbaceous aerial parts" refers to the use of the entire above-ground portion of herbaceous plants.

### Ailment categorization

Ailments were categorized using the International Classification of Primary Care (ICPC-2) framework (WONCA 2005) as a guiding structure and harmonized with ethnobotanical studies from comparable regions (Umair et al. 2017; Rehman et al. 2023). Where necessary, informant-reported therapeutic functions were retained as distinct subcategories while aligned within the broader ICPC-2 system. This approach resulted in 43 ailment categories, encompassing respiratory, gastrointestinal, cardiovascular, dermatological, musculoskeletal, urinary, and gynecological disorders.

### Plant collection and identification

Plant specimens mentioned by informants were collected from various vegetation types, photographed in their natural habitats, pressed between sheets of newspaper, and dried using wooden presses with daily paper changes. The collected material was identified using standard floristic keys and relevant botanical literature (Karyagin 1957; Damirov et al. 1983). Physical voucher specimens were prepared and deposited at the Department of Pharmacognosy, Azerbaijan Medical University, for the majority of taxa. For species where full herbarium preservation was not feasible due to conservation or logistical constraints, high-resolution photographic vouchers and detailed field records were archived to ensure traceability and taxonomic verification. Scientific names and taxonomic verification were confirmed using Plants of the World Online (POWO 2025).

### Ethical considerations

Before each interview, the purpose of the study was clearly explained, and verbal informed consent was obtained from all participants. Permission to conduct interviews was granted by local authorities, community elders, and municipal representatives. Because the study involved non-clinical ethnobotanical interviews without medical intervention or the collection of personal health data, formal institutional review board (IRB) approval was not required in accordance with national research practices in Azerbaijan. No sensitive personal health information was collected during the study, and informed consent included permission to publish anonymized ethnobotanical information. All procedures were conducted in accordance with local ethical

standards and complied with the International Society of Ethnobiology Code of Ethics (ISE 2006). Informants' identities were anonymized during data processing and reporting to ensure confidentiality.

### Quantitative data analysis

Quantitative analysis of ethnomedicinal data enhances the ability to identify culturally significant species and evaluate their potential pharmacological relevance. In this study, several widely recognized ethnobotanical indices were used to assess the relative importance of medicinal plants, informant consensus, and the cultural value of different taxa. In this study, each distinct plant use reported by an individual informant for a specific ailment category was treated as a separate use-report. Thus, if a species was reported by the same informant for different ailment categories, each category was counted separately.

#### Use Value (UV)

The Use Value (UV) of each species was calculated following Barkatullah et al. (2018):

$$UV = \sum U_i / N$$

Where,  $\sum U_i$  is the total number of use reports recorded for a species, and  $N$  is the total number of informants interviewed. UV reflects the relative cultural importance of each species based on how frequently it is mentioned.

#### Frequency of Citation (FC)

The Frequency of Citation (FC) represents the number of informants who mentioned a particular species (Hilou et al. 2014). FC values range from zero (when no informant cited the species) to the total number of respondents who recognized the species as useful (Ahmad et al. 2018).

#### Relative Frequency of Citation (RFC)

RFC was calculated following Birjees et al. (2022):

$$RFC = FC / N$$

Where,  $FC$  is the number of informants who cited the species, and  $N$  is the total number of interviewed participants. This index normalizes citation frequency and allows comparison of species importance across communities.

#### Fidelity Level (FL%)

The Fidelity Level (FL) quantifies the proportion of informants using a species for the same ailment category, following Friedman et al. (1986):

$$FL (\%) = (N_p / N) \times 100$$

Where,  $N_p$  is the number of informants who cited the species for a specific ailment, and  $N$  is the total number of informants who mentioned the species for any use. A high FL value indicates strong agreement on the species' therapeutic specificity.

#### Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) was calculated according to Umair et al. (2017):

$$ICF = (Nur - N_t) / (Nur - 1)$$

Where,  $Nur$  is the number of use reports for a given ailment category, and  $N_t$  is the number of species used to treat that ailment. Higher ICF values indicate stronger informant consensus concerning the treatment of specific disease categories.

#### Family Importance Value

FIV was calculated following Ali et al. (2018):

$$FIV = (FC_{family} / N) \times 100$$

Where,  $FC_{family}$  is the number of informants who mentioned at least one species within a given family (each informant counted once), and  $N$  is the total number of informants interviewed. This index highlights plant families with the highest ethnomedicinal relevance in the study area.

The present study is descriptive-quantitative in design and does not involve inferential statistical comparisons or uncertainty estimation (e.g., confidence intervals), as the aim was to document and quantify ethnobotanical knowledge rather than test group-level differences.

## RESULTS AND DISCUSSION

### Demographic profile of informants

A total of 105 individuals participated in the ethnobotanical survey conducted across the Zagatala District. The respondent group consisted of 31 women and 74 men, ranging in age from 28 to 92 years. The highest representation was observed among individuals aged 61-70 years, who also demonstrated the greatest depth of ethnomedicinal knowledge. Education levels varied, with most participants having completed secondary school, while others reported either incomplete secondary education or higher academic qualifications. Respondents were employed in a variety of occupations, including teaching, agriculture, municipal service, animal husbandry, forestry, and domestic work, reflecting the socio-economic diversity of the region. Elderly participants and traditional practitioners provided the most comprehensive information regarding plant uses, while younger informants exhibited comparatively limited knowledge. The remaining respondents were general community members who reported ethnomedicinal knowledge derived from household practices and personal experience. A detailed summary of the demographic characteristics of the respondents is presented in Table 2. The predominance of older informants indicates that ethnomedicinal knowledge in the Zagatala District is mainly preserved among senior community members, highlighting the potential risk of gradual knowledge erosion among younger generations.

**Table 2.** Demographic characteristics of respondents, including specialist informants, participating in the ethnobotanical survey

Parameter	Category	Number of respondents (n = 105)	Percentage (%)
Gender	Female	31	29.52
	Male	74	70.48
Age group (years)	28-40	6	5.71
	41-50	17	16.19
	51-60	20	19.05
	61-70	28	26.67
	71-80	27	25.71
	81-92	7	6.67
Educational level	Secondary	54	51.43
	Incomplete secondary	5	4.76
	Higher education	46	43.81
Marital status	Married	76	72.38
	Single	9	8.57
	Widowed	20	19.05
Occupation	Housewife	7	6.67
	Teacher	32	30.48
	Local executive representative	8	7.62
	Municipality officer	16	15.24
	Retired	25	23.80
	Forester	5	4.76
	Shepherd	3	2.86
	Farmer	9	8.57
	Informant type	Traditional plant healer / knowledgeable respondent	7
General community member	98	93.33	

### Diversity of medicinal plants

Ethnobotanical surveys conducted in the Zagatala District resulted in the identification of 121 medicinal plant species belonging to 115 genera and 44 families (Table 3). The distribution of species across families showed considerable variation, with Lamiaceae represented by 17 species, followed by Asteraceae with 14 species, Rosaceae with 13 species, and Fabaceae with 7 species. In contrast, several families, such as Pedaliaceae, Amaryllidaceae, Hypericaceae, Urticaceae, and Polygonaceae, were represented by only a single species.

### Ailment categories and Informant Consensus Factor

A total of forty-three ailment categories were documented during the ethnobotanical survey. As illustrated in Figure 2, the Informant Consensus Factor (ICF) values for these categories ranged between 0.94 and 1.00, indicating a high level of agreement among informants regarding which plant species are traditionally used for particular health conditions.

The most frequently cited uses included laxative purposes (429 use-reports; ICF = 0.98), liver disorders (364; 0.97), antitussive applications (356; 0.97), atherosclerosis (310; 0.97), common cold (290; 0.98), mouth ulcers (286;

0.96), gastric ulcers (272; 0.97), broncholytic uses (255; 0.99), cardiovascular diseases (249; 0.98), and gastrointestinal disorders (229; 0.96). These high ICF scores reflect strong consistency among respondents in their selection of medicinal plants for specific ailment categories, but do not imply the pharmacological effectiveness of the reported species. In categories where ICF reached 1.00, this value may be associated with a single reported species ( $N_t = 1$ ), and should therefore be interpreted cautiously. The full distribution of taxa, use reports, and ICF values is presented in Table 4. Here, Nur represents the total number of use-reports recorded for each ailment category, where each distinct plant use reported by an informant for a specific ailment was counted separately.

The top five disease categories treated with medicinal plants were respiratory system disorders (41 species; 1300 use-reports; 18.33%) and gastrointestinal disorders (41 species; 1251 use-reports; 17.63%), followed by cardiovascular diseases (29 species; 861 use-reports; 12.14%), central nervous system disorders (27 species; 644 use-reports; 9.07%), and dermatological and cosmetology-related conditions (26 species; 633 use-reports; 8.92%) (Figure 3).

### Plant families and Family Importance Value (FIV)

The analysis of ethnomedicinal plants recorded in the study area revealed considerable variation in the ethnobotanical significance of different plant families. In total, 44 families were documented, and their importance values were calculated based on the frequency of citation provided by informants. Several families exhibited notably high FIV scores, particularly Pedaliaceae (60.00%), Hypericaceae (55.24%), Rosaceae (51.28%), Orchidaceae (50.48%), Urticaceae (49.52%), Polygonaceae (49.52%), Amaryllidaceae (49.52%), and Apiaceae (51.43%). These families were frequently mentioned for the management of multiple ailment categories reported during the survey.

Regarding species richness, Lamiaceae was the most diverse family with 17 species, followed by Asteraceae with 14 species, Rosaceae with thirteen species, and Fabaceae with 7 species. Several families, including Viburnaceae, Verbenaceae, Scrophulariaceae, and Salicaceae, were represented by a single species. The complete FIV results for all families are presented in Table 5.

### Relative Frequency of Citation (RFC) and Frequency of Citation (FC)

The Relative Frequency of Citation (RFC) and Frequency of Citation (FC) values revealed clear differences in the perceived therapeutic importance of medicinal plant species within the study area. Species with the highest RFC values – indicating widespread recognition among informants – also exhibited the highest absolute citation frequencies (FC). These included *Rosa clinophylla* (RFC = 0.96; FC = 101), *Thymus caucasicus* (RFC = 0.96; FC = 101), *Alcea rugosa* (RFC = 0.94; FC = 99), *Origanum vulgare* (RFC = 0.94; FC = 99), *Urtica dioica* (RFC = 0.93; FC = 98), *Plantago major* (RFC = 0.92; FC = 97), *Sesamum indicum* (RFC = 0.91; FC = 96), and *Mentha longifolia* (RFC = 0.90; FC = 95). These species represent the core ethnomedicinal taxa widely recognized across the district.

**Table 3.** Medicinal plant species used in traditional medicine in the Zagatala District, Azerbaijan, with associated ethnobotanical indices

Family	Scientific name	Ailments treated	Informant citation	FL	ΣU	Plant part used	FIV	UV	FC	RFC
Amaranthaceae	<i>Amaranthus retroflexus</i> L.	Liver diseases	32	74.42	38	Herb		0.36	43	0.41
		Expectorant	11	25.58						
Amaranthaceae	<i>Beta vulgaris</i> L.	Atherosclerosis	38	44.19	57	Tuberous root	46.3	0.54	86	0.82
		Liver diseases	26	30.23						
		Arrhythmia	22	25.58						
Amaranthaceae	<i>Spinacia oleracea</i> L.	Laxative	51	100	51	Leaf		0.49	51	0.49
Amaryllidaceae	<i>Allium cepa</i> L.	Toothache	30	35.29	54	Bulb		0.51	85	0.81
		Common cold diseases	43	50.59						
		Anthelmintic	12	14.12						
		Atherosclerosis	31	35.63						
Amaryllidaceae	<i>Allium sativum</i> L.	Anthelmintic	36	41.38	50	Bulb	49.52	0.48	87	0.83
		Sleep disorders	20	22.99						
		Gastrointestinal disorders	17	32.69						
Anacardiaceae	<i>Cotinus coggygria</i> Scop.	Antihairloss	35	67.31	38	Leaf		0.36	52	0.5
Anacardiaceae	<i>Pistacia vera</i> L.	Memory impairment	21	30.43	51	Fruit	42.38	0.49	69	0.66
		Atherosclerosis	48	69.57						
Apiaceae	<i>Anethum graveolens</i> L.	Appetite stimulant	21	23.08	57	Fruit		0.54	91	0.87
		Sedative	14	15.38						
		Atherosclerosis	25	27.47						
		Arterial hypertension	31	34.07						
		Expectorant	29	35.37						
Apiaceae	<i>Carum carvi</i> L.	Hemorrhoids	30	36.59	47	Fruit	51.43	0.45	82	0.78
		Prostatitis	23	28.05						
		Choleretic	44	52.38						
Apiaceae	<i>Coriandrum sativum</i> L.	Memory impairment	40	47.62	53	Fruit		0.5	84	0.8
		Antitussive	29	33.72						
Apiaceae	<i>Foeniculum vulgare</i> Mill.	Carminative	37	43.02	57	Fruit		0.54	86	0.82
		Expectorant	20	23.26						
		Mouth ulcers	48	68.57						
Apiaceae	<i>Pimpinella anisum</i> L.	Antitussive	22	31.43	56	Fruit		0.53	70	0.67
Asphodelaceae	<i>Eremurus spectabilis</i> M. Bieb.	Gastrointestinal disorders	16	100	16	Leaf	15.24	0.15	16	0.15
Asteraceae	<i>Achillea millefolium</i> L.	Antihairloss	32	39.51	39	Herb		0.37	81	0.77
		Anti-inflammatory	20	24.69						
		Anti-dandruff	29	35.8						
		Wound healing	11	25						
Asteraceae	<i>Anthemis cotula</i> L.	Sprain	18	40.91	22	Flower	35.17	0.21	44	0.42
		Headache	15	34.09						
		Dermatological diseases	16	37.21						
Asteraceae	<i>Artemisia absinthium</i> L.	Appetite stimulant	19	44.19	24	Herb		0.23	43	0.41
		Sedative	8	18.6						
Asteraceae	<i>Calendula officinalis</i> L.	Kidney diseases	46	54.12	57	Flower		0.54	85	0.81

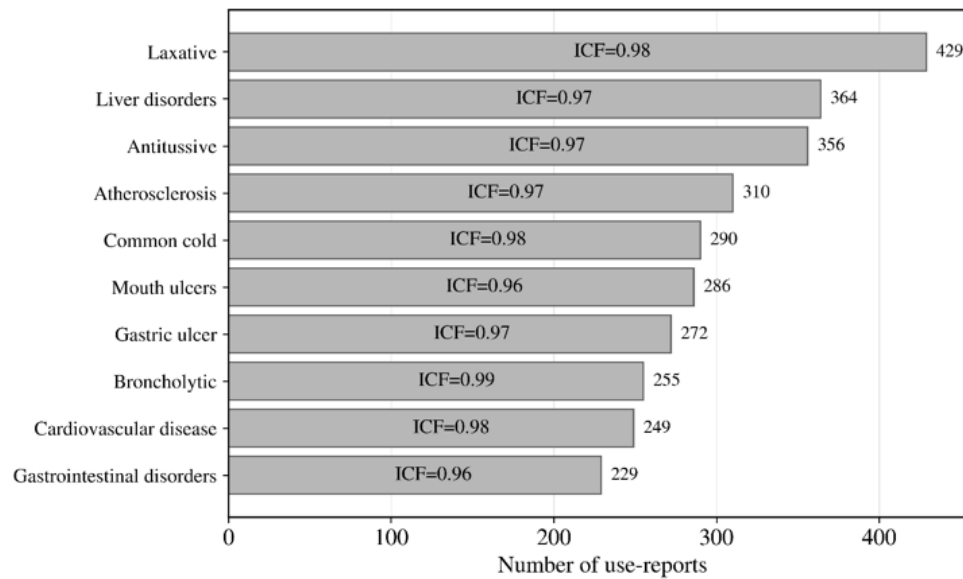
		Gingivitis	15	17.65						
		Dry skin	24	28.24						
Asteraceae	<i>Carthamus tinctorius</i> L.	Liver diseases	20	42.55	31	Flower		0.3	47	0.45
		Choleretic	27	57.45						
Asteraceae	<i>Centaurea cyanus</i> L.	Antipyretic	7	28	20	Flower		0.19	25	0.24
		Sleep disorders	18	72						
Asteraceae	<i>Cichorium intybus</i> L.	Broncholytic	26	50						
		Gingivitis	17	32.69	33	Root		0.31	52	0.5
		Gastrointestinal disorders	9	17.31						
Asteraceae	<i>Helichrysum plinthocalyx</i> (C. Koch) Soson.	Choleretic	36	58.06	45	Flower		0.43	62	0.59
		Atherosclerosis	26	41.94						
Asteraceae	<i>Inula helenium</i> L.	Antitussive	40	51.95	48	Rhizome		0.46	77	0.73
		Diabetes mellitus	37	48.05						
Asteraceae	<i>Lactuca sativa</i> L.	Gastrointestinal disorders	29	100	29	Leaf		0.28	29	0.28
Asteraceae	<i>Silybum marianum</i> (L.) Gaertn.	Liver diseases	39	60.94	47	Seed		0.45	64	0.61
		Choleretic	25	39.06						
Asteraceae	<i>Taraxacum montanum</i> (C.A. Mey.) DC.	Liver diseases	42	61.76	52	Root		0.5	68	0.65
		Atherosclerosis	26	38.24						
Asteraceae	<i>Tragopogon collinus</i> DC.	Liver diseases	14	100	14	Leaf		0.13	14	0.13
Asteraceae	<i>Tussilago farfara</i> L.	Antitussive	31	43.66	56	Leaf		0.53	71	0.68
		Expectorant	40	56.34						
Berberidaceae	<i>Berberis vulgaris</i> L.	Choleretic	47	100	47	Fruit	44.76	0.45	47	0.45
Berberidaceae	<i>Corylus avellana</i> L.	Memory impairment	38	61.29	47	Fruit	44.76	0.45	62	0.59
		Prostatitis	24	38.71						
Brassicaceae	<i>Brassica oleracea</i> L.	Hemorrhoids	28	57.14	34	Leaf		0.32	49	0.47
		Dry skin	21	42.86						
Brassicaceae	<i>Capsella bursa-pastoris</i> Medik.	Gynecological disorders	19	33.93						
		Sprain	17	30.36	27	Herb	38.73	0.26	56	0.53
		Kidney diseases	20	35.71						
Brassicaceae	<i>Rhaphanus sativus</i> L.	Expectorant	23	30.67	61	Tuberous root		0.58	75	0.71
		Antitussive	52	69.33						
Campanulaceae	<i>Campanula latifolia</i> L.	Anti-inflammatory	9	36	18	Herb	17.14	0.17	25	0.24
		Rheumatic diseases	16	64						
Cannabinaceae	<i>Humulus lupulus</i> L.	Sleep disorders	38	52.78	44	Cones	41.9	0.42	72	0.69
		Sedative	34	47.22						
Capparaceae	<i>Capparis herbacea</i> Willd.	Toothache	37	100	37	Fruit	35.24	0.35	37	0.35
Cucurbitaceae	<i>Cucurbita maxima</i> Duchesne	Liver diseases	19	31.67						
		Gingivitis	23	38.33	41	Fruit	39.05	0.39	60	0.57
		Anthelmintic	18	30						
Dipsacaceae	<i>Cephalaria gigantea</i> (Lebed.) Bobr	Common cold diseases	22	100	22	Flower	16.19	0.21	22	0.21
Dipsacaceae	<i>Scabiosa argentea</i> L.	Diabetes mellitus	12	100	12	Leaf		0.11	12	0.11
Eleagnaceae	<i>Elaeagnus angustifolia</i> L.	Sprain	30	69.77	39	Fruit		0.37	43	0.41
		Laxative	13	30.23			43.81			
Eleagnaceae	<i>Hippophae rhamnoides</i> L.	Wound healing	27	36.99	53	Fruit		0.5	73	0.7
		Prostatitis	46	63.01						

Equisetaceae	<i>Equisetum arvense</i> L.	Diuretic	25	37.31						
		Kidney diseases	27	40.3	41	Herb	39.05	0.39	67	0.64
		Antirolithic	15	22.39						
Fabaceae	<i>Astragalus caucasicus</i> Pall.	Antidandruff	17	100	17	Herb		0.16	17	0.16
Fabaceae	<i>Glycyrrhiza glabra</i> L.	Broncholytic	43	57.33						
		Anti-inflammatory	13	17.33	52	Root		0.5	75	0.71
		Gingivitis	19	25.33						
Fabaceae	<i>Medicago caucasica</i> Vass.	Dermatological diseases	17	100	17	Herb	24.35	0.16	17	0.16
Fabaceae	<i>Onobrychis cornuta</i> (L.) Desv.	Rheumatic diseases	28	66.67	29	Herb		0.28	42	0.4
		Dry skin	14	33.33						
Fabaceae	<i>Vicia angustifolia</i> L.	Diabetes mellitus	29	100	29	Herb		0.28	29	0.28
Fabaceae	<i>Trigonella cancellata</i> Desf. Ex Spreug	Wound healing	19	100	19	Herb		0.18	19	0.18
Fabaceae	<i>Trifolium caucasicum</i> Tausch.	Expectorant	16	100	16	Herb		0.15	16	0.15
Fagaceae	<i>Castanea sativa</i> Mill.	Hemorrhoids	47	100	47	Fruit	36.19	0.45	33	0.31
Fagaceae	<i>Quercus castaneifolia</i> C.A. Mey.	Mouth ulcers	29	100	29	Bark		0.28	29	0.28
Gentianaceae	<i>Centaurium erythraea</i> Raf.	Enuresis	19	31.15						
		Rheumatic diseases	9	14.75	39	Herb		0.37	61	0.58
		Appetite stimulant	21	34.43			32.86			
		Arrhythmia	12	19.67						
Gentianaceae	<i>Gentiana cruciata</i> L.	Atherosclerosis	26	70.27	30	Root		0.29	37	0.35
		Appetite stimulant	11	29.73						
Geraniaceae	<i>Geranium molle</i> L.	Mouth ulcers	33	100	33	Herb	23.81	0.31	33	0.31
Geraniaceae	<i>Geranium rotundifolium</i> L.	Hemorrhoids	17	100	17	Herb		0.16	17	0.16
Hypericaceae	<i>Hypericum perforatum</i> L.	Dermatological diseases	22	27.16						
		Anti-inflammatory	13	16.05	58	Herb	55.24	0.55	81	0.77
		Diabetes mellitus	17	20.99						
		Sleep disorder	29	35.8						
Juglandaceae	<i>Juglans regia</i> L.	Atherosclerosis	38	64.41	44	Fruit	41.9	0.42	59	0.56
		Cardiovascular diseases	21	35.59						
Lamiaceae	<i>Betonica orientalis</i> L.	Sedative	28	65.12	36	Herb		0.34	43	0.41
		Wound-healing	15	34.88						
Lamiaceae	<i>Dracocephalum austriacum</i> L.	Anti-inflammatory	20	32.26						
		Carminative	25	40.32	33	Herb		0.31	62	0.59
		Gum inflammation	17	27.42						
Lamiaceae	<i>Lamium album</i> L.	Cardiovascular diseases	24	32						
		Kidney diseases	32	42.67	51	Herb		0.49	75	0.71
		Mouth ulcers	19	25.33						
Lamiaceae	<i>Leonurus quinquelobatus</i> Gilib.	Sedative	24	64.86	28	Herb	42.41	0.27	37	0.35
		Sleep disorders	13	35.14						
Lamiaceae	<i>Melissa officinalis</i> L.	Sedative	27	38.57						
		Carminative	28	40	40	Herb		0.38	70	0.67
		Cardiovascular diseases	15	21.43						
Lamiaceae	<i>Mentha aquatica</i> L.	Kidney diseases	19	22.62						
		Antirolithic	14	16.67	48	Herb		0.46	84	0.8
		Sedative	28	33.33						
		Memory impairment	23	27.38						

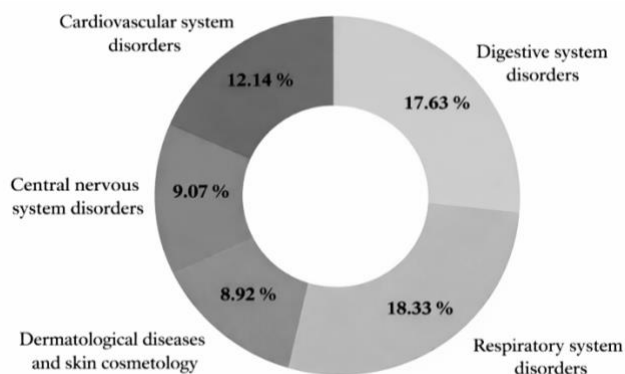
Lamiaceae	<i>Mentha longifolia</i> (L.) Huds.	Sedative	30	31.58						
		Carminative	22	23.16	43	Leaf		0.41	95	0.9
		Headache	29	30.53						
Lamiaceae	<i>Nepeta dagestanica</i> Pojark.	Arrhythmia	14	14.74						
		Gastric ulcer	20	28.99						
		Gynecological diseases	19	27.54	43	Leaf		0.41	69	0.66
Lamiaceae	<i>Origanum vulgare</i> L.	Prostatitis	30	43.48						
		Kidney diseases	48	48.48						
		Sedative	12	12.12	68	Herb		0.65	99	0.94
		Gastrointestinal disorders	39	39.39						
Lamiaceae	<i>Phlomis pungens</i> Willd.	Antihairloss	47	100	47	Herb		0.45	47	0.45
Lamiaceae	<i>Salvia sclarea</i> L.	Antidandruff	12	13.33						
		Dermatological diseases	18	20						
		Gynecological diseases	19	21.11	54	Leaf		0.51	90	0.86
		Gingivitis	25	27.78						
Lamiaceae	<i>Satureja hortensis</i> L.	Hemorrhoids	16	17.78						
		Antihairloss	9	10.34						
		Diuretic	27	31.03						
		Prostatitis	15	17.24	50	Herb		0.48	87	0.83
		Mouth ulcers	22	25.29						
		Varicose veins	14	16.09						
Lamiaceae	<i>Scutellaria orientalis</i> L.	Common cold diseases	28	100	28	Herb		0.27	28	0.27
Lamiaceae	<i>Stachys pubescens</i> Ten.	Antipyretic	11	28.21	33	Herb		0.31	39	0.37
		Cardiovascular diseases	28	71.79						
Lamiaceae	<i>Teucrium polium</i> L.	Mouth ulcers	15	34.09	36	Herb		0.34	44	0.42
		Enuresis	29	65.91						
Lamiaceae	<i>Thymus caucasicus</i> Willd. ex Ronniger	Antipyretic	54	53.47	78	Herb		0.74	101	0.96
		Carminative	47	46.53						
Lamiaceae	<i>Ziziphora capitata</i> L.	Gastrointestinal disorders	34	62.96	41	Herb		0.39	54	0.51
		Mouth ulcers	20	37.04						
Malvaceae	<i>Alcea rugosa</i> Alef.	Antitussive	27	27.27						
		Laxative	35	35.35	73	Flower		0.7	99	0.94
		Diabetes mellitus	16	16.16						
Malvaceae	<i>Althaea officinalis</i> L.	Antidandruff	21	21.21			23.17			
		Antitussive	39	61.9	43	Root		0.41	63	0.6
		Gastric ulcer	24	38.1						
Malvaceae	<i>Malva sylvestris</i> L.	Broncholytic	44	48.35						
		Mouth ulcers	20	21.98	51	Leaf		0.49	91	0.87
		Gastric ulcer	27	29.67						
Moraceae	<i>Ficus carica</i> L.	Laxative	39	45.35						
		Antitussive	14	16.28	48	Fruit		0.46	86	0.82
		Cardiovascular diseases	33	38.37			45.24			
Moraceae	<i>Morus alba</i> L.	Liver diseases	35	43.75						
		Gastric ulcer	29	36.25	47	Fruit		0.45	80	0.76
		Toothache	16	20						
Lythraceae	<i>Punica granatum</i> L.	Memory impairment	33	36.26	47	Fruit	44.76	0.45	91	0.87

		Sleep disorders	28	30.77						
		Gum inflammation	30	32.97						
Lythraceae	<i>Peganum harmala</i> L.	Wound healing	17	65.38	23	Herb	21.9	0.22	26	0.25
		Sleep disorders	9	34.62						
Orchidaceae	<i>Ophrys caucasica</i> Woronow ex Grossh.	Gastric ulcer	48	57.14	59	Tuberous root		0.56	84	0.8
		Antitussive	36	42.86			50.48			
Orchidaceae	<i>Orchis mascula</i> L.	Gastric ulcer	39	61.9	47	Tuberous root		0.45	63	0.6
		Headache	24	38.1						
Orchidaceae	<i>Chelidonium majus</i> L.	Choleretic	34	42.5	59	Herb		0.56	80	0.76
		Cancer diseases	46	57.5						
Orchidaceae	<i>Fumaria vaillantii</i> Loisl.in Desv.	Liver diseases	31	63.27	38	Herb	40.32	0.36	49	0.47
		Diabetes mellitus	18	36.73						
Orchidaceae	<i>Glaucium corniculatum</i> (L.) J. Rudolf	Antitussive	24	52.17	30	Herb		0.29	46	0.44
		Expectorant	22	47.83						
Pedaliaceae	<i>Sesamum indicum</i> L.	Liver diseases	44	45.83	63	Fruit	60	0.6	96	0.91
		Atherosclerosis	52	54.17						
Plantaginaceae	<i>Plantago lanceolata</i> L.	Gastric ulcer	39	48.15	54	Leaf		0.51	81	0.77
		Antitussive	42	51.85						
Plantaginaceae	<i>Plantago major</i> L.	Sprain	17	17.53	59	Leaf		0.56	97	0.92
		Diabetes mellitus	34	35.05						
		Gastric ulcer	46	47.42			41.43			
Plantaginaceae	<i>Veronica arvensis</i> L.	Diuretic	30	55.56	38	Herb		0.36	54	0.51
		Appetite stimulant	24	44.44						
Plantaginaceae	<i>Linaria vulgaris</i> L.	Enuresis	12	44.44	23	Herb		0.22	27	0.26
		Varicose veins	15	55.56						
Polygonaceae	<i>Polygonum monspeliense</i> Thieb. ex Pers.	Antiurrolithic	49	100	49	Herb		0.47	49	0.47
Polygonaceae	<i>Polygonum hydropiper</i> L.	Gynecological diseases	34	100	34	Herb	49.52	0.32	34	0.32
Polygonaceae	<i>Rumex tuberosus</i> L.	Rheumatic diseases	17	20.48	73	Leaf		0.7	83	0.79
		Laxative	66	79.52						
Portulacaceae	<i>Portulaca oleracea</i> L.	Dry skin	26	44.07	41	Herb	39.05	0.39	59	0.56
		Laxative	33	55.93						
Primulaceae	<i>Primula macrocalyx</i> Bunge.	Common cold diseases	29	63.04	35	Root	33.33	0.33	46	0.44
		Mouth ulcers	17	36.96						
Ranunculaceae	<i>Pulsatilla albana</i> (Stev.) Bercht.et J. Presl	Anti-inflammatory	28	100	28	Herb	26.67	0.27	28	0.27
Rhamnaceae	<i>Frangula alnus</i> Mill.	Laxative	32	100	32	Bark		0.3	32	0.3
Rhamnaceae	<i>Rhamnus cathartica</i> L.	Laxative	44	100	44	Fruit	36.19	0.42	44	0.42
Rhamnaceae	<i>Ziziphus jujuba</i> Mill.	Gastrointestinal disorders	38	100	38	Fruit		0.36	38	0.36
Rosaceae	<i>Alchemilla sericea</i> Willd.	Mouth ulcers	24	60	27	Leaf		0.26	40	0.38
		Gynecological diseases	16	40						
Rosaceae	<i>Amygdalus communis</i> L.	Laxative	29	38.16	55	Fruit		0.52	76	0.72
		Dermatological diseases	47	61.84						
Rosaceae	<i>Armeniaca vulgaris</i> Lam.	Cardiological diseases	56	70.89	69	Fruit	51.28	0.66	79	0.75
		Dermatological diseases	23	29.11						
Rosaceae	<i>Crataegus orientalis</i> Bieb. (Mill) M. Bieb	Cardiological diseases	72	83.72	80	Fruit		0.76	86	0.82
		Sleep disorders	14	16.28						
Rosaceae	<i>Cydonia oblonga</i> Mill.	Choleretic	33	36.26	77	Fruit		0.73	91	0.87

		Liver diseases	35	38.46						
		Antipyretic	23	25.27						
Rosaceae	<i>Fragaria vesca</i> L.	Common cold diseases	48	100	48	Fruit		0.46	48	0.46
Rosaceae	<i>Malus orientalis</i> Uglitzk.	Dry skin	40	75.47						
		Anti-inflammatory	13	24.53	48	Fruit		0.46	53	0.5
Rosaceae	<i>Mespilus germanica</i> L.	Gastrointestinal disorders	17	36.96	34	Fruit		0.32	46	0.44
		Memory impairment	29	63.04						
Rosaceae	<i>Potentilla argentea</i> L.	Antidandruff	38	55.88	47	Rhizome		0.45	68	0.65
		Gastrointestinal disorders	30	44.12						
Rosaceae	<i>Prunus spinosa</i> L.	Laxative	56	100	56	Fruit		0.53	56	0.53
Rosaceae	<i>Pyrus acutiserrata</i> Gladkova	Laxative	31	100	31	Fruit		0.3	31	0.3
Rosaceae	<i>Rosa tomentosa</i> Smith.	Kidney diseases	40	39.6						
		Common cold diseases	34	33.66	62	Fruit		0.59	101	0.96
		Liver diseases	27	26.73						
Rosaceae	<i>Rubus ibericus</i> Juz.	Mouth ulcers	39	45.88	66	Fruit		0.63	85	0.81
		Common cold diseases	46	54.12						
Rubiaceae	<i>Galium album</i> L.	Varicose veins	20	52.63	27	Herb		0.26	38	0.36
		Headache	18	47.37			37.14			
Rubiaceae	<i>Rubia tinctorum</i> L.	Antiuro lithic	44	70.97	51	Rhizome		0.49	62	0.59
		Gynecological diseases	18	29.03						
Salicaceae	<i>Salix alba</i> L.	Rheumatic diseases	29	35.8						
		Varicose veins	36	44.44	49	Bark	46.67	0.47	81	0.77
		Gum inflammation	16	19.75						
Scrophulariaceae	<i>Verbascum gossypinum</i> M. Bieb	Sprain	17	34						
		Enuresis	33	66	46	Flower	43.81	0.44	50	0.48
Verbenaceae	<i>Verbena officinalis</i> L.	Antiuro lithic	35	60.34						
		Gynecological diseases	23	39.66	39	Herb	37.14	0.37	58	0.55
Viburnaceae	<i>Viburnum lantana</i> L.	Gynecological diseases	42	100	42	Bark	40	0.4	42	0.4
Violaceae	<i>Viola alba</i> Besser	Common cold diseases	40	52.63	50	Leaf		0.48	76	0.72
		Dermatological diseases	36	47.37			40.95			
Violaceae	<i>Viola tricolor</i> L.	Antipyretic	27	48.21	36	Leaf		0.34	56	0.53
		Diuretic	29	51.79						
Urticaceae	<i>Urtica dioica</i> L.	Kidney diseases	43	43.88						
		Choleretic	16	16.33	52	Leaf	49.52	0.5	98	0.93
		Gynecological diseases	39	39.8						



**Figure 2.** Informant Consensus Factor (ICF) values for the top 10 ailment categories in the Zagatala District, ranked according to the number of recorded use-reports



**Figure 3.** Proportion of total use-reports attributed to the five most frequently treated ailment categories in the Zagatala District, illustrating the dominant role of respiratory and digestive system disorders in traditional medicine

In contrast, species with low RFC values - such as *Lomelosia argentea*, *Tragopogon collinus*, *Trigonella stellata*, *Eremurus spectabilis*, *Trifolium ochroleucon* subsp. *ochroleucon*, *Geranium rotundifolium*, *Astragalus caucasicus*, and *Medicago × varia* - were cited by relatively few informants and showed correspondingly low FC values. The RFC values were predominantly distributed within the low to moderate range, while comparatively fewer species exhibited high values. The overall RFC distribution is illustrated in Figure 4.

#### Fidelity Level (FL)

A total of 29 plant species showed a Fidelity Level (FL) of 100%, indicating that all recorded citations for each of

these species were associated with a single ailment category in the study. These included *Spinacia oleracea*, *E. spectabilis*, *Lactuca sativa*, *T. collinus*, and *Berberis vulgaris*, among others. The lowest FL values were observed for *Centaureum erythraea* (14.75%), *M. longifolia* (14.74%), *Allium cepa* (14.12%), *Salvia sclarea* (13.33%), *O. vulgare* (12.12%), and *Satureja hortensis* (10.34%).

#### Use Value (UV)

UV values are calculated based on the number of use reports recorded per species relative to the total number of informants. The highest UV values were recorded for *Crataegus orientalis* (0.76), *T. caucasicus* (0.74), *Cydonia oblonga* (0.73), *Rumex hymenosepalus* (0.70), and *A. rugosa* (0.70), which represent the five most culturally significant species in the study area (Figure 5). Other species with relatively high UV values included *Prunus armeniaca* (0.66), *O. vulgare* (0.65), *Rubus aetnicus* (0.63), and *S. indicum* (0.60). In contrast, the lowest UV values were found in species such as *L. argentea* (0.11), *T. collinus* (0.13), *E. spectabilis* (0.15), *T. ochroleucon* (0.15), *A. caucasicus* (0.16), *Medicago × varia* (0.16), and *G. rotundifolium* (0.16).

#### Growth forms of medicinal plants

Among the 121 documented medicinal plant species, 97 were herbs (80.16%), 16 were trees (13.22%), 7 were shrubs (5.79%), and 1 species was a liana (0.83%). Herbs represented the dominant life form within the medicinal flora of the district. Here, 'herbs' refers to the life form of plants, whereas plant-part use is analyzed separately below.

**Table 4.** Distribution of taxa (Nt), use-reports (Nur), and Informant Consensus Factor (ICF) across different ailment categories

Type of ailment	Nt	Nur	ICF
Oral and dental disorders			
Mouth ulcers	11	286	0.96
Toothache	3	83	0.98
Gum inflammation	3	63	0.97
Gingivitis	5	99	0.96
Respiratory system disorders			
Common cold diseases	8	290	0.98
Broncholytic	3	255	0.99
Antitussive	11	356	0.97
Expectorant	7	161	0.96
Anti-inflammatory	7	116	0.95
Antipyretic	5	122	0.97
Digestive system disorders			
Gastrointestinal disorders	9	229	0.96
Gastric ulcer	8	272	0.97
Appetite stimulant	5	96	0.96
Laxative	11	429	0.98
Anthelmintic	3	66	0.97
Carminative	5	159	0.97
Cardiovascular system disorders			
Arrhythmia	3	48	0.96
Arterial hypertension	1	31	1
Atherosclerosis	9	310	0.97
Hemorrhoids	5	138	0.97
Cardiovascular diseases	7	249	0.98
Varicose veins	4	85	0.96
Central nervous system disorders			
Sedative	9	205	0.96
Sleep disorders	8	169	0.96
Headache	4	86	0.96
Memory impairment	6	184	0.97
Urinary system disorders			
Enuresis	4	93	0.97
Kidney disorders	8	113	0.94
Prostate disorders	5	138	0.97
Antiuro lithic	5	157	0.97
Diuretic	4	111	0.97
Liver disorders			
Liver disorders	12	364	0.97
Choleretic	8	262	0.97
Dermatological diseases and skin cosmetology			
Dermatological diseases	7	179	0.97
Antidandruff	5	117	0.97
Dry skin	5	125	0.97
Antihairloss	4	123	0.98
Wound healing	5	89	0.95
Musculoskeletal disorders			
Rheumatic diseases	5	99	0.96
Sprain	5	99	0.96
Other diseases			
Gynecological diseases	9	229	0.96
Diabetes mellitus	7	163	0.96
Cancer diseases	1	46	1

### Plant parts used

A total of eleven plant parts were reported. Whole herbaceous aerial parts were the most frequently used plant part (43 species; 35.54%), followed by fruits (30 species;

24.79%), leaves (19; 15.70%), flowers (8; 6.61%), roots (6; 4.96%), tubers (4; 3.31%), bark (4; 3.31%), rhizomes (3; 2.47%), bulbs (2; 1.65%), cones (1; 0.83%), and seeds (1; 0.83%). Figure 6 illustrates the proportional distribution of plant parts used.

### Mode of preparation

Infusions (i.e., steeping plant material in hot water) constituted the most common preparation method (44%), followed by decoctions (i.e., boiling plant material in water) (20%) and incorporation into food (11%). Other, less frequently reported methods included fruit juices (7%), fresh use (6%), extracts (5%), poultices (4%), massage applications (2%), and plant ash (1%). A detailed summary of preparation methods is presented in Table 6.

### Discussion

The present study highlights the depth and resilience of traditional ethnomedicinal knowledge preserved among the inhabitants of the Zagatala District. This knowledge, transmitted across generations, remains an essential component of primary healthcare, especially in rural communities where access to modern medical services is often limited. The high diversity of medicinal plant species documented reflects the ecological heterogeneity of the Greater Caucasus foothills and the continued cultural reliance on plant-based remedies in the region.

From an ecological and cultural perspective, the taxonomic composition of the recorded medicinal flora is consistent with ethnomedicinal studies from other temperate mountainous regions. Families such as Lamiaceae, Asteraceae, and Rosaceae were the most species-rich, aligning with their global prominence as sources of aromatic and bioactive taxa. In contrast, several families represented by a single species – such as Pedaliaceae and Hypericaceae – still exhibited high ethnomedicinal value in the community. Thus, ethnomedicinal importance reflects cultural and therapeutic relevance rather than species richness alone.

From a quantitative ethnobotanical perspective, the very high Informant Consensus Factor (ICF) values (0.94-1.00) across all ailment categories indicate a strong and culturally consistent agreement among community members regarding plant selection for common health problems. Particularly high consensus for respiratory, gastrointestinal, and cardiovascular disorders suggests that these ailment groups are culturally salient within the community. Environmental and socio-economic factors may plausibly influence local health patterns; however, in the absence of epidemiological data, this interpretation remains tentative. It is important to note that some ailment categories, such as arterial hypertension and cancer, showed ICF values of 1.00. This value does not necessarily indicate “perfect” agreement among informants, but rather reflects the fact that only a single species was reported for these conditions (Nt = 1). In such cases, ICF = 1.00 reflects highly specific or limited plant-use reports rather than universally shared consensus and should therefore be interpreted with caution.

**Table 5.** Family Importance Value (FIV) of the recorded plant families

Plant families	Number of plant species	FIV
Amaranthaceae	3	46.30
Amaryllidaceae	2	49.52
Anacardiaceae	2	42.38
Apiaceae	5	51.43
Asphodelaceae	1	15.24
Asteraceae	14	35.17
Berberidaceae	1	44.76
Betulaceae	1	44.76
Brassicaceae	3	38.73
Campanulaceae	1	17.14
Cannabaceae	1	41.90
Capparaceae	1	35.24
Cucurbitaceae	1	39.05
Dipsacaceae	2	16.19
Elaeagnaceae	2	43.81
Equisetaceae	1	39.05
Fabaceae	7	24.35
Fagaceae	2	36.19
Gentianaceae	2	32.86
Geraniaceae	2	23.81
Hypericaceae	1	55.24
Juglandaceae	1	41.90
Lamiaceae	17	42.41
Malvaceae	3	23.17
Moraceae	2	45.24
Lythraceae	1	44.76
Nitrariaceae	1	21.90
Orchidaceae	2	50.48
Papaveraceae	3	40.32
Pedaliaceae	1	60.00
Plantaginaceae	4	41.43
Polygonaceae	3	49.52
Portulacaceae	1	39.05
Primulaceae	1	33.33
Ranunculaceae	1	26.67
Rhamnaceae	3	36.19
Rosaceae	13	51.28
Rubiaceae	2	37.14
Salicaceae	1	46.67
Scrophulariaceae	1	43.81
Verbenaceae	1	37.14
Viburnaceae	1	40.00
Violaceae	2	40.95
Urticaceae	1	49.52

**Table 6.** Modes of preparation of medicinal plants used in the Zagatala District

Mode of preparation	Percentage (%)
Infusion	44
Decoction	20
Used as food	11
Fruit juice	7
Fresh use	6
Extract	5
Poultice	4
Massage	2
Plant ash	1

The Family Importance Value (FIV) analysis further illustrates the interaction between ecological availability and cultural preference in shaping ethnomedicinal plant selection. Families with high FIV scores, even those represented by only one or a few species such as Pedaliaceae and Hypericaceae, often include taxa with long-standing medicinal reputations, strong cultural symbolism, and historically entrenched therapeutic roles. In contrast, species-rich families such as Lamiaceae and Asteraceae contribute a broad diversity of medicinal taxa and provide a wide functional spectrum of traditional remedies.

At the species level, ethnobotanical indices such as RFC, UV, FL, and FC collectively reveal the balance between cultural prominence and therapeutic specificity, with Fidelity Level (FL) particularly reflecting the degree of agreement among informants on species-specific medicinal uses. Species such as *R. clinophylla*, *T. caucasicus*, and *O. vulgare* demonstrated high citation frequencies and use values, highlighting their central role in local healthcare systems, whereas species with lower RFC or UV values appear to represent more specialized or localized knowledge held by smaller segments of the population.

Comparison with ethnobotanical studies from adjacent Caucasus regions further highlights both regional continuity and local specificity in medicinal plant use. Ethnobotanical surveys conducted in western and central Georgia (e.g., Guria, Racha, and Lechkhumi) document a high diversity of medicinal plant taxa and emphasize the role of ecological factors, elevation, and geographic isolation in shaping traditional plant-use systems (Bussmann et al. 2016; Bussmann et al. 2018). In these studies, *Rosa* is represented among culturally important taxa, with *Rosa* sp. ranked within the upper percentile of species by Use Diversity and Use Value (Bussmann et al. 2016), while *Thymus* taxa are also documented among medicinal plants in the region (Bussmann et al. 2018).

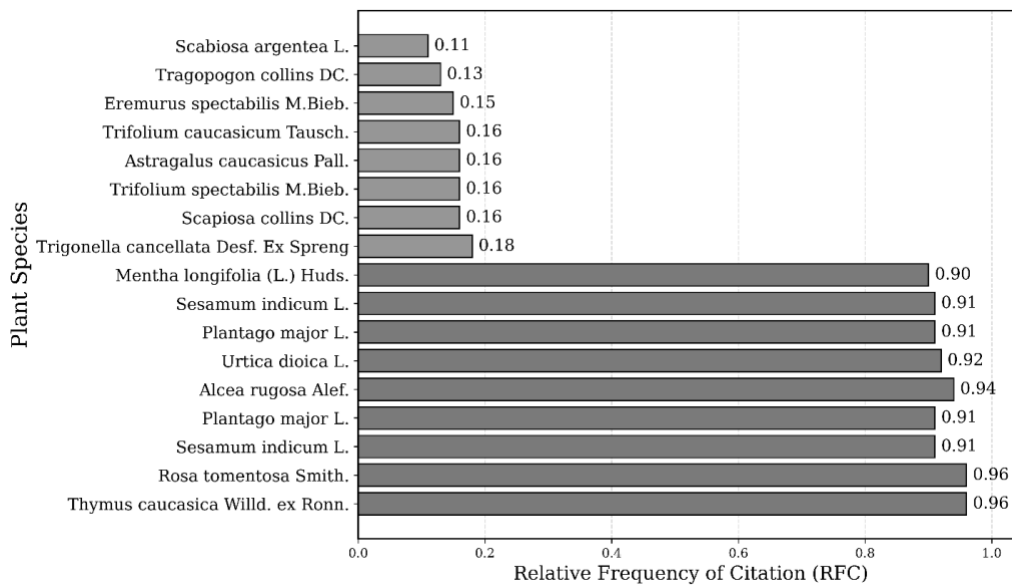
Bussmann et al. (2016) evaluated species using indices such as Use Value (UV), Use Diversity (UD), and Cultural Importance Value (CIV), whereas Bussmann et al. (2018) reported Informant Consensus Factor (ICF) across use categories and applied multivariate analyses to assess regional variation. Because different combinations of quantitative indices were applied across these studies, direct species-level comparisons of cultural prominence and therapeutic specificity remain limited. In contrast, the present study identifies *R. clinophylla* and *T. caucasicus* as particularly prominent species based on a combination of complementary quantitative indices, suggesting that while ethnomedicinal knowledge is shared at the generic level across the Caucasus, species-level prominence reflects local ecological availability and culturally embedded preferences.

Growth form patterns also mirror both ecological availability and cultural practice. The dominance of herbaceous species is consistent with their abundance in the local environment and their ease of collection, processing, and preparation. The preference for aerial plant parts – particularly herbs, leaves, and fruits – aligns with traditional beliefs regarding potency, as well as practical considerations

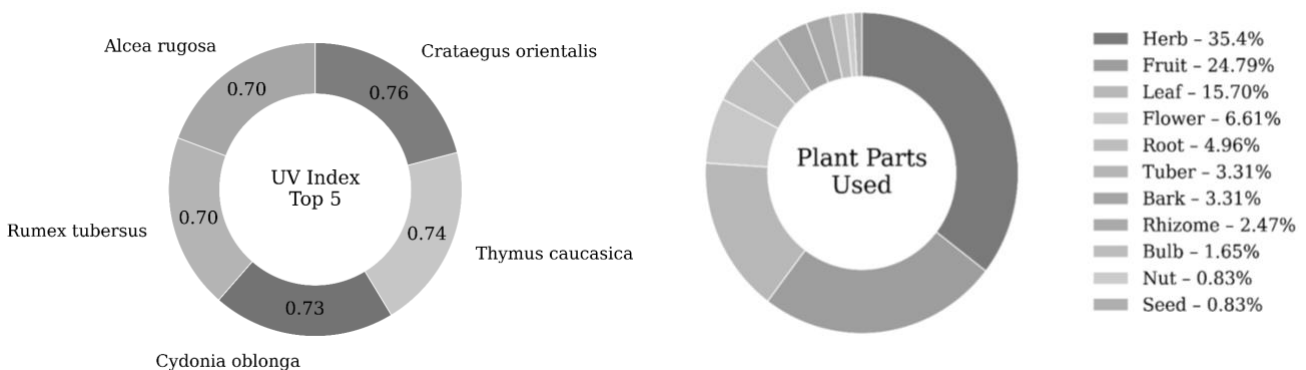
related to harvesting sustainability. Similarly, the predominance of infusions and decoctions as preparation methods reflects common water-based preparation practices in traditional medicine.

The predominance of elderly informants highlights the importance of intergenerational knowledge transmission and the potential vulnerability of traditional plant-based knowledge. The observed gender imbalance among respondents may also have influenced the distribution of recorded plant uses, reflecting local sociocultural roles and possibly underrepresenting certain knowledge domains.

Overall, the findings emphasize the importance of documenting and maintaining the ethnomedicinal traditions of the Zagatala District. Species with high informant consensus and cultural salience may warrant monitoring attention, as their prominence could reflect relatively higher use intensity. Although harvesting pressure and population status were not assessed in this study, precautionary monitoring and sustainable use practices may help support the long-term availability of culturally significant taxa. These species also represent promising candidates for future phytochemical and pharmacological research.



**Figure 4.** Relative Frequency of Citation (RFC) values of the most and least cited medicinal plant species in the Zagatala District, showing species with the highest community recognition (e.g., *Thymus caucasicus*, *Rosa clinophylla*) and those with limited local use



**Figure 5.** Medicinal plant species with the highest Use Value (UV) in the Zagatala District, highlighting the five culturally most significant taxa based on the frequency of recorded use-reports

**Figure 6.** Distribution of plant parts used in traditional medicine in the Zagatala District, demonstrating the predominance of whole herbaceous aerial parts, fruits, and leaves among all recorded medicinal applications

### Limitations

Although the present study provides a comprehensive assessment of ethnomedicinal knowledge in the Zagatala District, several limitations should be acknowledged. First, the demographic composition of the informants was uneven, with elderly individuals—particularly elderly men—being more frequently represented. This reflects local cultural norms surrounding knowledge sharing as well as the purposive and snowball sampling strategies, which tended to identify senior male knowledge holders more readily. This may result in the under-representation of women's and younger generations' ethnomedicinal knowledge. Consequently, knowledge domains traditionally associated with women, such as household remedies, childcare practices, and food-based therapeutics, may be comparatively under-documented in the present dataset. Second, the data rely on self-reported information, which may be influenced by recall bias or selective memory, especially among older informants. Third, the cross-sectional nature of the study does not allow assessment of temporal changes or seasonal variations in plant use. While quantitative indices such as UV, RFC, and ICF provide valuable insights into cultural importance and consensus, they do not constitute evidence of clinical efficacy. Although all species were taxonomically identified and assigned voucher numbers, not all taxa were preserved as physical herbarium specimens due to logistical and conservation constraints. This may limit independent verification for certain taxa; however, comprehensive photographic documentation and detailed field records were retained to minimize this limitation. Finally, some remote villages were more difficult to access, which may have limited the representativeness of local variations in plant knowledge. These limitations should be considered when interpreting the results and point to the need for future longitudinal, gender-balanced, and experimentally validated research.

In conclusion, this quantitative ethnobotanical study conducted in the Zagatala District documents a rich and consensus-driven traditional pharmacopoeia. The results support this hypothesis. Based on interviews with 105 informants, a total of 121 medicinal plant species belonging to 44 families were recorded, demonstrating a high level of ethnomedicinal diversity in the study area. The families Asteraceae, Lamiaceae, and Rosaceae were the most frequently cited. Whole herbaceous aerial parts constituted the most commonly used plant part category, and infusion was the dominant preparation method. Through the application of quantitative indices such as Use Value (UV) and Relative Frequency of Citation (RFC), this study identifies *C. orientalis*, *T. caucasicus*, and *C. oblonga* as priority species for monitoring and sustainable use planning, as well as promising candidates for future phytochemical and pharmacological research. The high informant agreement across ailment categories and the elevated ethnobotanical indices recorded for many species suggest a culturally consistent and widely shared traditional healthcare system. Among the documented flora, several species emerged as culturally and therapeutically prominent taxa, including *C. orientalis* (UV = 0.76), *T. caucasicus* (UV = 0.74; RFC = 0.96), *C. oblonga* (UV = 0.73), *R. tomentosa* (RFC = 0.96),

and *A. rugosa* (RFC = 0.94). These species represent high-value candidates for further bioactivity-oriented investigation. Given the continued reliance of local communities on plant-based remedies, precautionary conservation-oriented measures may be considered. Recommended actions include community-based monitoring of highly harvested species (e.g., *T. caucasicus* and *R. tomentosa*), sustainable wild-harvesting practices, small-scale cultivation of culturally important taxa, awareness initiatives to support intergenerational knowledge transmission. Future research could focus on phytochemical profiling of high-UV/RFC species, experimental validation of therapeutic properties, cross-regional comparative ethnobotanical studies in other multi-ethnic regions of Azerbaijan, and integration of local ecological knowledge into conservation and sustainable management.

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