



An ethnobotanical study of wild plant resources used among locals of high mountainous regions of Swat Valley, Pakistan

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Research

Abstract

Background: Local communities in Swat District, Pakistan, possess rich ethnobotanical knowledge of plant resources, developed through long-term interaction with their mountainous environment. This study aimed to document ethnobotanical practices, evaluate socio-cultural factors influencing knowledge retention and transmission, and identify plant species of high medicinal and cultural significance.

Methods: Data were collected between 2018 and 2022 from 300 informants aged 20-90 years across seven Tehsils using structured and semi-structured interviews and group discussions. Quantitative indices including Use Value (UV), Relative Frequency of Citation (RFC), Fidelity Level (FL), and Informant Consensus Factor (ICF) were applied to assess plant significance. Statistical analyses such as chi-square tests, correlation analysis, and one-way ANOVA examined relationships between knowledge and socio-demographic variables.

Results: The present study documented 234 plant species from 74 families. Dominant families were Poaceae (20%), Rosaceae (9%), Fabaceae (7%), Asteraceae (5%), and Brassicaceae (3%). Plants were mainly used for fodder (52%), medicine (42%), and fuelwood (25%). Leaves (42%) and fruits (19%) were the most utilized parts. *Taxus wallichiana* ranked highest (RFC = 0.60, UV = 0.90, FL = 100%), followed by *Punica granatum* and *Ricinus communis*. ICF values (0.92-0.98) indicated strong informant consensus. Knowledge varied significantly with gender, age, occupation, and ethnicity ($p < 0.001$), with a strong positive correlation between age and traditional knowledge ($\rho = 0.60$, $p < 0.001$).

Conclusions: Indigenous knowledge remains vital for healthcare and livelihoods but faces threats from modernization. Community-based conservation is essential to protect biodiversity and ethnobotanical heritage.

Keywords: Ethnobotany, Indigenous knowledge, Traditional medicine, Plant-use patterns, High-altitude flora, Swat Valley, Pakistan, Socio-cultural influences, Conservation strategies, Use Value, Relative Frequency of Citation, Medicinal plants, Sustainable utilization

Background

Pakistan is a country of remarkable biocultural and ecological diversity, endowed with abundant natural resources, diverse ethnic groups, and a rich historical heritage. Its complex geography, spanning plains, deserts, and some of the world's highest mountain ranges, creates a variety of ecological niches that support extensive plant diversity. Among them approximately 6,000 documented flowering plant species in Pakistan, over 600 species are reported to have medicinal uses, highlighting the importance of traditional plant knowledge for human health and cultural practices (Shah *et al.* 2020; Khan *et al.* 2023). The alpine and sub-alpine regions of the Himalayas, Karakoram, and HinduKush harbor most of the nation's unique and endemic flora, forming the backbone of local medicinal systems and traditional economies (Bibi *et al.* 2023). Wild species dominate the medicinal flora, and an estimated 70-80% of the rural population relies on traditional herbal remedies as primary healthcare, reflecting both cultural continuity and economic necessity (Amin *et al.* 2024; Hussain *et al.* 2020). The distribution of these species is largely governed by edaphic and climatic factors, while the complex topography produces micro-habitats that support high species richness (Shah *et al.* 2020; Bibi *et al.* 2023). Recent ethnobotanical investigations in northern Pakistan and the Western Himalaya underscore the urgent need to systematically document the traditional knowledge of plants held by local communities. Studies from the regions such as Harighal, Malakand, Kohistan, and Palas Valley have documented hundreds of medicinal species used for both human and livestock healthcare, revealing that modernization, habitat loss, and climate change pose significant threats to both biodiversity and cultural heritage (Shah *et al.* 2020; Khan *et al.* 2023; Bibi *et al.* 2023; Hussain *et al.* 2020; Amin *et al.* 2024).

Swat Valley, located at the confluence of the Himalayan, HinduKush, and Karakoram ranges, is one of Pakistan's most floristically significant districts. Its heterogeneous terrain, ranging from alpine meadows to dense forests, combined with variable climatic regimes, creates conditions that support remarkable plant diversity (Ali *et al.* 2023; Ali *et al.* 2024). While Swat is widely recognized for its biodiversity, most previous research has focused on taxonomic documentation of flora, with ethnobotanical relationships how local communities utilize plants for medicine, food, fuel, fodder, household materials, cultural rituals, and economic purposes remaining underexplored. Recent field surveys in Swat have documented hundreds of plant species used in traditional medicine and other ethnobotanical applications: for example, 112 species across 63 families were recorded in Lalku Valley (Sher *et al.* 2023), and 153 medicinal species in Sakhra Valley (Shah *et al.* 2025). These studies underscore both the richness of traditional plant knowledge and its vulnerability to modernization, habitat loss, and climate change (Ali *et al.* 2023; Alam *et al.* 2024). Swat is also emerging as a center for ethnobotanical commerce, contributing to local livelihoods while highlighting the need for sustainable management and conservation of its plant resources (Ali *et al.* 2024).

Ethnobotany, first formally defined by Harshberger (1896) and later expanded by Martin (1995), is the systematic study of the complex relationships between human societies and plants. It examines how communities perceive, utilize, and manage plant resources within ecological, cultural, and socio-economic contexts. Modern ethnobotanical research increasingly employs quantitative indices such as Frequency of Citation, Relative Frequency of Citation, Use Value, and Fidelity Level to enhance scientific rigor and comparability (Phillips & Gentry 1993; Tardío & Pardo-de-Santayana 2008). These metrics allow researchers to identify culturally important plants, assess agreement among informants, prioritize species for conservation, and investigate potential pharmacological value.

Recent ethnobotanical studies from 2020 to 2024 in northern Pakistan and the Western Himalaya underscore the urgent need to document traditional plant knowledge, as modernization, habitat loss, and climate change threaten both biological diversity and cultural heritage (Shah *et al.* 2020; Khan *et al.* 2023; Ahmad *et al.* 2021; Amin *et al.* 2024; Rehman *et al.* 2023; Dilbar *et al.* 2023). The current study investigates how socio-cultural factors shape plant-use patterns, traditional ethnobotanical knowledge distribution, and conservation practices among the native peoples in the high mountainous regions of the Swat, Pakistan. It explores how demographic variables such as age, education, and occupation influence the retention and transmission of plant knowledge, while identifying species of high medicinal and cultural significance. It is hypothesized that socio-cultural attributes significantly influence traditional knowledge; species with higher Use Value and Relative Frequency of Citation face greater exploitation pressure; and modernization contributes to the erosion of traditional ethnobotanical knowledge among younger generations.

Materials and Methods

Study area

The Swat district is located in the HinduKush mountain ranges of Pakistan. Swat Valley is famed for its stunning scenery and is called the "Switzerland of the East." This nickname was given by Queen Elizabeth II in 1961 due to its snow-capped peaks,

lush meadows, forests, rivers, and glaciers (Ali 2023; and Ali *et al.* 2023). Ancient Gandhara obelisks and a variety of beautiful valleys may be found in Swat. Swat is situated in the northwest of Pakistan. It is surrounded by the protected regions of Buner and Malakand on the south, Chitral and Ghizer on the North, Shangla and Indus Kohistan on the East, and Dir located on the West regions as shown in (figure 1). It is located between 34° 34' and 35° 55' north latitude and 72° 08' to 72° 50' east longitude (Hamayun 2007). About 2.3 million individuals exist in approximately 5337 km² area as per the Census 2017. Swat proper and Swat Kohistan are the sub-division of the area. The upper mountain range along the Swat River, which reaches all the way to Ain in the south, is referred to as Swat Kohistan region. The majority of the population in Swat Valley resides in rural, mountainous villages characterized by traditional rustic lifestyle Caste-wise, Yousafzai Pakhtun, Mians (Sayeds), Kohistanis, Gujjars, and Parachas make up the bulk of the population. The Yousafzai Pakhtun have a close relationship with the Afghan Ghazni. The Gujjars and Kohistanis live in the upper mountainous areas and speak different languages such as Gujjro, Garwi, Torwali, and Kohistani. The Kohistanis live in the valleys of Kalam, Ushu, Utror, and Gabral. The peregrine Gujjars are a major source of concern for those living in the northern parts of the Valley (Hamayun 2007). Although lower and upper zone of the area have significant temperature ranges, the region's environment is not particularly harsh. The month of June is often the hottest month in the year due to longer days and shorter nights. The lowest and highest recorded temperatures are 2 and 11, respectively (Shinwari *et al.* 2003). The cyclonic rain often falls in the summer because the majority of the territory is botanically categorized as being in the Sino-Japanese region (Ali and Qaiser 1986). The mean annual precipitation in the area recorded approximately average annual rainfall in the area is 33 inches, and 125.4 days. Snows lead to an accumulation of 4.5 feet of snow in the area. Swat is one of the most floristic district throughout the Pakistan with about seven different kinds of forests range from Tropical dry deciduous to alpine forest. Nearly 1550 vascular plants and 55 pteridophytes from the area have been described (Hamayun *et al.* 2006). Through in-depth ethnobotanical research, several scholars have described around 345 traditional Swat plant species (Ahmad & Sirajuddin, 1996).

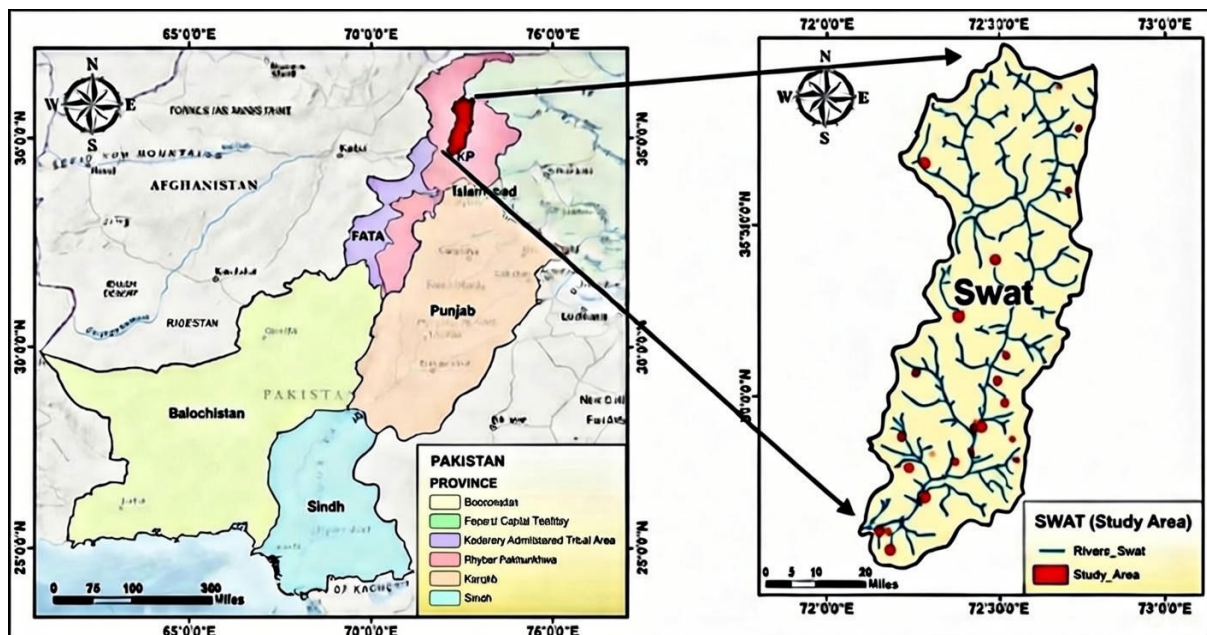


Figure 1. Map of the Swat District, Pakistan

Field Survey and Data Collection

Ethnobotanical fieldwork was carried out over a four year period, from March 2018 to November 2022, across Swat District which comprises seven administrative tehsils such Babuzai, Matta, Kabal, Khwazakhela, Charbagh, Barikot, and Bahrain. Each Tehsil represents distinct ecological zones; altitudinal ranges (600 to 5900 m) above sea level, and cultural practices. Including all seven Tehsils ensured comprehensive representation of the valley's environmental and cultural heterogeneity, encompassing vegetation types from subtropical chir pine forests and temperate coniferous zones to high alpine meadows. This approach captured variation in both plant diversity and ethnobotanical knowledge systems shaped by altitude, climate, and resource accessibility, which was essential to assess how geographic and socio-cultural differences influence local plant-use patterns and conservation priorities. A total of 30 villages were selected from these Tehsils using a stratified multi-stage approach to ensure both ecological and socio-cultural representativeness (Table 1). Villages were chosen to cover the full range of altitudinal zones and vegetation types including remote settlements highly dependent on wild plant resources and semi-urban communities influenced by modernization. Selection criteria included accessibility, safety, willingness of

communities to participate, prior ethnobotanical activity, and consultation with village elders, local herbalists (hakims), and district forest officers to confirm suitability. This multi-stage village selection ensured both spatial balance and cultural diversity across the sample, while individuals without ethnobotanical knowledge were excluded from participation.

A combination of purposive and snowball sampling was used to select informants, allowing for both in-depth insights and broader representation of ethnobotanical knowledge. Initially, 60 key informants (approximately 20% of the total) were identified based on recognized expertise in medicinal plant use, including traditional healers, midwives, shepherds, and experienced farmers. Their expertise was verified through community reputation, prior involvement in ethnobotanical activities, and referrals from other key informants. Additional participants were recruited via the snowball technique to include general community members with ethnobotanical knowledge. A total of 300 informants (250 men and 50 women), aged 20-90 years, were interviewed, representing diverse age groups, educational backgrounds, and occupations (Table 2). This sample size was chosen to achieve data saturation, ensuring that no new information emerged and allowing meaningful comparisons across gender, age, occupation, and Tehsils. The observed gender imbalance reflects local socio-cultural norms, where men are more active in forest-based plant collection, while women's knowledge is often home-based. Nevertheless, efforts were made to include knowledgeable women, particularly regarding medicinal plants and food preparation. Due to Pakhtun cultural norms and the practice of Parda (gender segregation), open interviews with women were not always feasible. Female informants were interviewed privately or through trusted intermediaries, ensuring culturally sensitive data collection while respecting community norms. Potential biases associated with purposive and snowball sampling were mitigated by including multiple key informants in each village, verifying expertise through cross-references, and triangulating information across participants to capture collective knowledge rather than isolated opinions. Interviews were conducted face-to-face, typically lasting 30-60 minutes, with repeat visits for clarification and observation of plant use in practice. Data collection continued until saturation was reached, ensuring a robust and reliable dataset. Collected plant specimens were assigned voucher numbers for proper taxonomic identification; however, these specimens were not deposited in any herbarium. Each collection was accompanied by detailed field notes, including locality, altitude, habitat type, phenological stage, and local Pashto name provided by informants. Preliminary identification was performed in the field with the help of experienced local botanists and reference to regional floras, including *Flora of Pakistan* (Nasir & Ali, 1971-2002) and *Flora of Swat* (Ahmad & Sirajuddin, 1996). All specimens were subsequently identified and authenticated by Dr. Sayed Afzal Shah, Assistant Professor at the National University of Medical Sciences, Islamabad, Pakistan. Scientific names were cross-checked and updated using authoritative online databases, including World Flora Online and Tropicos, to ensure current nomenclature.

Table 1. Villages surveyed in Swat District, including geographic, climatic, and ethnobotanical sampling details.

Village	Tehsil	Latitude	Longitude	Elevation (m)	Avg Prec. (mm)	Avg Temp	Sample Size (n)	Male (n)	Female (n)
Asharai	Kabal	34.687° N	72.7135° E	1,138	611	23°C	15	10	5
Bahrain	Bahrain	35.207° N	72.5456° E	1,425	866	16.6°C	20	12	8
Baidara	Matta	34.960° N	72.4399° E	1,132	611	23°C	15	9	6
Barikot	Barikot	34.676° N	72.2216° E	796	726	19.6°C	18	11	7
Charbagh	Charbagh	34.835° N	72.4436° E	980	897	12°C	12	7	5
Churprial	Matta	34.981° N	72.3631° E	1,288	866	16.6°C	15	9	6
Darmai	Matta	35.081° N	72.4473° E	1,423	611	23°C	18	10	8
Fatehpur	Khwazakhela	35.067° N	72.4865° E	1,687	965	16°C	20	12	8
Gabral	Bahrain	35.525° N	72.4125° E	2,286	524	4°C	10	6	4
Gulibagh	Charbagh	34.880° N	72.4554° E	1,050	897	12°C	12	7	5
Kabal	Kabal	34.792° N	72.2825° E	845	897	22°C	18	11	7
Kalakaly	Kabal	34.849° N	72.2689° E	1,021	890	22°C	15	9	6
Kalam	Bahrain	35.490° N	72.5796° E	2,001	639	13.4°C	20	12	8
Kanju	Kabal	34.821° N	72.3488° E	987	897	22°C	15	9	6
Khwazakhela	Khwazakhela	34.937° N	72.4687° E	1,151	969	16°C	18	11	7
Kokarai	Charbagh	34.738° N	72.4251° E	1,112	897	21°C	15	9	6
Madyan	Bahrain	35.140° N	72.5353° E	1,320	866	16.6°C	20	12	8
Mahodand	Bahrain	35.713° N	72.6510° E	2,865	1361	13.4°C	12	7	5
MalamJabba	Charbagh	34.799° N	72.5722° E	2,465	539	22°C	12	7	5
Mankyal	Bahrain	35.328° N	72.6181° E	5,957	93	14°C	8	5	3
Marghazar	Babuzai	34.667° N	72.3431° E	1,340	897	13.4°C	15	9	6
Matta	Matta	34.930° N	72.4169° E	1,120	611	23°C	15	10	5
Miandam	Khwazakhela	35.054° N	72.5648° E	1,800	866	16.6°C	18	11	7

Odigram	Babuzai	34.752° N	72.2986° E	1,132	897	21°C	15	9	6
Pir Kalay	Matta	34.129° N	71.5033° E	1,062	611	23°C	12	7	5
Qalagai	Kabal	34.793° N	71.7741° E	1,288	900	20°C	15	9	6
Sangota	Charbagh	34.794° N	72.4100° E	1,120	897	12°C	12	7	5
Shawar	Matta	35.430° N	74.6357° E	1,548	611	23°C	15	10	5
Usho	Bahrain	35.607° N	72.6901° E	2,300	2670	13.4°C	12	7	5
Utror	Bahrain	35.491° N	72.4687° E	2,300	3310	16°C	20	12	8

Questionnaire used for data collection

A questionnaire was developed to systematically document ethnobotanical knowledge and plant use practices among local communities. The instrument was designed following ethnobotanical standards outlined and was refined through pilot testing in two representative villages prior to full deployment. The questionnaire was divided into three main parts to ensure comprehensive coverage of demographic and ethnobotanical information.

Part 1: Socio-demographic information.

This section collected background data on each informant, including age, gender, education level, occupation, religion, native language, village name, duration of residence in the area, and primary sources of plant knowledge (e.g., family inheritance, community elders, traditional healers, or personal experience). These data were crucial for analyzing the influence of socio-cultural and demographic variables on variables influence the acquisition and transmission of traditional knowledge.

Part 2: Ecological and availability data.

This section documented on documenting each plant's local name, abundance, natural habitat, collection frequency, harvesting methods, growing season, trade status, and perceived population trends. These parameters provided insight into the ecological distribution and conservation status of species, as well as their accessibility and cultural significance within communities.

Part 3: Ethnomedicinal and ethnobotanical uses.

This section was divided into two components. The first component addressed ethnomedicinal applications, gathering detailed information on plant parts used, methods of preparation, routes of administration, dosage, duration of treatment, diseases treated, combination with other ingredients, taste properties, and preferred solvents. The second component focused on non-medicinal ethnobotanical uses, including plants used as food, fodder, fuel, timber, furniture, agricultural tools, honeybee attractant, ornamental plants, and other domestic or ritual purposes. The interviews were orally conducted in native language Pashto. The questionnaire of this study was translated and explained to informants in their local dialect, and responses were recorded in real time. Informal discussions and participatory field walks complemented the formal interviews, allowing cross-verification of data and direct observation of plant-use practices in their natural context.

Quantitative Ethnobotanical Analysis

To systematically determined the cultural and medicinal importance of plants in the Swat Valley, several quantitative ethnobotanical indices are used. These indices provided objective measures to assess local knowledge, species use, and consensus among informants.

Frequency of Citation (FC)

The Frequency of Citation (FC) measures the number of informants reporting a specific plant species for any use. It serves as a simple indicator of the species' popularity and cultural importance within the community. FC was calculated as:

$$FC = \text{Number of informants mentioning the species}$$

Higher FC values indicate species that are widely recognized and frequently used.

Relative Frequency of Citation (RFC)

It indicates the cultural significance of a species within the community. It reflects how many informants recognize and use a particular species, helping researchers identify widely known and significant plants. RFC allows comparisons across species and highlights those with strong traditional relevance.

$$RFC = FC/N$$

Where N is the total number of informants. Values range from 0 (no citation) to 1 (cited by all informants).

Use Value (UV)

It quantifies the importance of each plant species based on the number of distinct uses documented from informant reports. It reflects the diversity of applications of a plant in daily life. UV calculated as:

$$UV = \frac{\sum U_i}{N}$$

Where U_i stands for the number of uses mentioned by each informant for a given plant species and N is the total number of informant. Species with higher UV values are considered more versatile or significant in traditional practices.

Fidelity Level (FL)

It assesses degree of consensus among informants for a particular use of a species. It is particularly useful to identify plants with high medicinal relevance. FL was calculated as:

$$FL (\%) = \frac{Np}{N} \times 100$$

Np represents the number of informants citing a particular use for a species, while N denotes the total number of informants who reported the species for any purpose. High FL values reflect a high level of consensus on the specific utility of that plant.

Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) is a widely used ethnobotanical index that quantifies the degree of consensus among informants on the application of plant species for treating particular groups of ailments. It helps identify which types of ailments well-shared knowledge and which plant species are most having trusted within the community.

$$ICF = Nur - Nt / Nur - 1$$

Where Nur is the total number of use reports recorded for a particular ailment category and Nt is the number of plant species utilized for treating that category.

Statistical Analyses

Statistical analyses were conducted to investigate the relationships between ethnobotanical knowledge and socio-demographic as well as environmental factors. The Chi-square (χ^2) test was used to assess associations among categorical variables such as gender, occupation, education, and participation in medicinal plant use. Correlation analysis (Pearson and Spearman, depending on data distribution) was applied to evaluate the strength and direction of relationships between continuous and ordinal variables, including age, education level, and years of experience. One-way ANOVA was employed to compare mean ethnobotanical knowledge and index values among different groups, such as Tehsils, villages, and occupational categories, to identify significant differences related to spatial, ecological, and socio-cultural factors. All statistical analyses were conducted using SPSS software (version 26.0), with statistical significance determined at $p < 0.05$. This approach allowed identification of demographic and environmental factors that significantly influence traditional plant knowledge, providing insights into patterns of plant use and conservation priorities across the study area.

Results

Demographic and Socio-Cultural Profile of Informants

Analysis of the demographic data revealed that ethnobotanical knowledge in the study area varied according to gender, occupation, and ethnicity. Male informants (83.3%) reported broad knowledge encompassing agriculture, livestock management, medicinal, and cultural plant uses, while female participants (16.7%) focused primarily on domestic, medicinal, and culinary applications. Among male participants, farmers (40%) and shepherds (32%) possessed the most extensive practical knowledge, particularly regarding plants used for food, fodder, and medicine, reflecting their daily interaction with the environment. In contrast, school students (12%) demonstrated minimal practical knowledge, whereas university graduates and teachers (each 8%) provided mainly cultural or historical insights into plant use. All female participants were housewives (50) and contributed specialized knowledge related to domestic and medicinal plant applications. Ethnic

background also shaped plant knowledge. Yousufzai (30%) and Shponkie (26.7%) informants reported wide-ranging knowledge of wild and medicinal plants, likely due to their proximity to forested and agricultural areas. Gujjers (16.7%) and Kohistani (10%) focused on fodder and pasture-related plants, reflecting their pastoral livelihoods. Mians (6.7%), Paraches (6.7%), and other minor ethnic groups (3.3%) contributed localized and culturally specific knowledge. Overall, these patterns indicate that ethnobotanical knowledge is strongly influenced by socio-cultural factors, including gender roles, occupational practices, and ethnic traditions, highlighting how traditional plant knowledge is maintained and transmitted within the community (in table 2).

Table 2. Demographic characteristics of informants in the study area.

Demographic Factor	Category	n	% of Total	Main Focus of Plant Knowledge
Gender	Male	250	83.3%	Agriculture, livestock, medicinal, and cultural uses
	Female	50	16.7%	Domestic, medicinal, and culinary uses
Occupation (Male)	Farmer	100	40%	Food, fodder, and medicinal plants
	Shepherd	80	32%	Fodder, medicinal, and pasture plants
	School Students	30	12%	Minimal practical knowledge
	University Graduates	20	8%	Cultural and historical plant uses
	Teacher	20	8%	Cultural and historical plant uses
Occupation (Female)	Housewife	50	100%	Domestic and medicinal uses
Ethnic group	Yousufzai	90	30%	Wild and medicinal plants
	Shponkie	80	26.7%	Wild and medicinal plants
	Gujjer	50	16.7%	Fodder and pasture plants
	Kohistani	30	10%	Fodder and pastoral plants
	Mian	20	6.7%	Localized traditional uses
	Parache	20	6.7%	Localized traditional uses
	Other	10	3.3%	Minor ethnic knowledge

Ethnobotanical Wealth and Traditional Plant Use

The Swat Valley is characterized by a rich ethnobotanical heritage, reflecting the deep and longstanding relationship between its inhabitants and the local flora. The present study documented 234 plant species, comprising 122 herbs, 27 shrubs, 72 trees, 7 climbers, and 6 ferns. These species were used for various purposes across the study area, as illustrated in Figure 2. The most dominant families were Poaceae (20%), followed by Rosaceae (9%), Fabaceae (7%), Asteraceae (5%), Brassicaceae (3%), Pinaceae (3%), Moraceae (2%), Amaranthaceae (2%), Boraginaceae (2%), Salicaceae (2%), Pteridaceae (1%), Adiantaceae (1%), and Apiaceae (1%) (Figure 3). The results indicate that local plant species play a crucial role in the livelihoods, healthcare, and cultural practices of the Swat valley residents. Documented plants were used for medicinal purposes, food, fuelwood, decoration, beekeeping, furniture making, agricultural implements, thatching, fencing, timber, and fodder. Among the 234 species, 98 were reported as medicinal plants employed in traditional therapies for various ailments. The most commonly utilized plant part was leaves (42%), followed by fruits (19%), shoots (16%), bark (9%), flowers (8%), seeds (5%), gum (4%), roots (4%), cones (2%), milky sap (2%), needles (2%), oil (1%), and cob (1%), as shown in Figure 4. Herbal preparations were primarily administered as infusions (42%), powders (19%), and decoctions (4%) as shown in Appendix 1. The documented species were used to treat a wide spectrum of health conditions, including fever, pain, diabetes, hepatitis, gastrointestinal disorders, cancer, eye infections, consumption, as well as serving as laxatives, diuretics, and tonics (Appendix 1).

Quantitative Analysis and Cultural Significance of Plant Species

Quantitative analysis such as RFC, UV, FL, and ICF highlighted both widely recognized and specialized species within the community. Among tree species, *Taxus wallichiana* showed the highest RFC (0.60) and UV (0.90), cited by 180 out of 300 informants for medicinal, fuel, and furniture purposes, with a FL of 100% for its primary medicinal use as an emmenagogue and antispasmodic. This species was also associated with high ICF values in categories related to blood circulation and musculoskeletal disorders, reflecting strong community agreement on its therapeutic efficacy. Other gymnosperms such as *Pinus wallichiana*, *Cedrus deodara*, and *Abies pindrow* had RFCs ranging from 0.45-0.55 and UVs of 0.70-0.85, primarily used for timber, furniture, and medicinal applications, with FL values of 85-95%, indicating strong consensus but some variation in use. *Cupressus sempervirens* and *Juniperus communis* showed moderate RFC (0.40-0.50) and UV (0.65-0.75), reflecting specialized medicinal and ornamental uses. Among shrubs, *Ricinus communis* and *Punica granatum* were highly valued, with RFCs of 0.55 and 0.58 and UVs of 0.80 and 0.85, respectively; both species had FL of 100% for their primary uses, including

medicinal and industrial purposes for *R. communis* and edible fruit and thatching for *P. granatum*. These species also showed high ICF values in relevant categories such as digestive problems, fever, and skin disorders, indicating strong agreement among informants regarding their efficacy. Other shrubs, such as *Berberis lyceum* and *Ziziphus jujuba*, had RFCs ranging 0.35-0.45 and UVs 0.60-0.70, with FL values of 80-90%, reflecting moderate consensus for medicinal and nutritional uses. Herbaceous species displayed variable but notable use; *Ephedra gerardiana*, *Achyranthes aspera*, and *Plantago lanceolata* had moderate UV (0.55-0.65) but high FL 90-95% for therapeutic uses, particularly for fever, kidney disorders, and wound healing, while *Valeriana jatamansi*, *Cichorium intybus*, and *Mentha longifolia* had lower RFCs (0.25-0.35) and UVs (0.40-0.55), indicating more specialized knowledge among fewer informants. Climbers, such as *Vitis vinifera* and *Cuscuta reflexa*, showed moderate RFC 0.30-0.40 and UV 0.45-0.55, mainly for medicinal and food purposes, with FL 85-90%, while local grasses including *Saccharum spontaneum* and *Cymbopogon jwarancusa* were primarily cited for fodder and thatching, RFC 0.25-0.35, UV 0.35-0.50, and FL 80-85%, reflecting more seasonal and specific use.

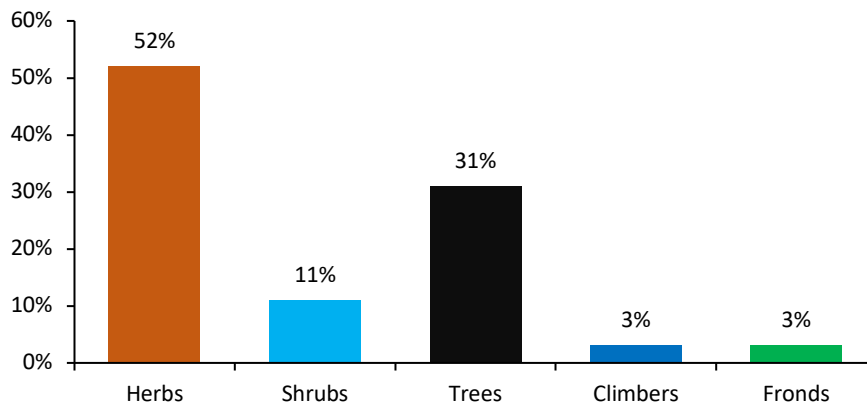


Figure 2. Plant groups with the highest usage in the study area.

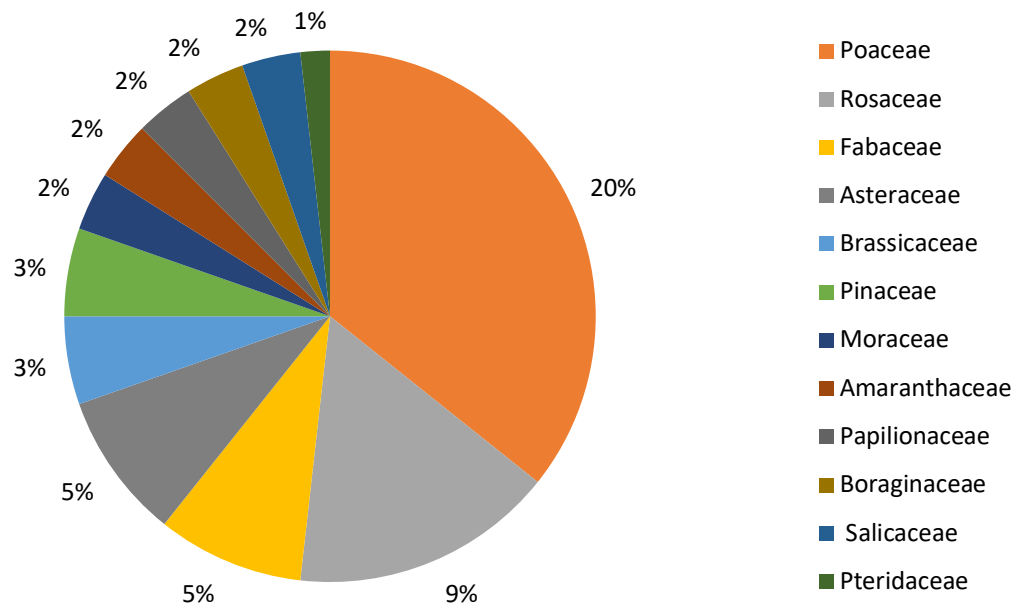


Figure 3. Families with the highest number of plant species used in the study area.

The study calculated Informant Consensus Factor (ICF) values to determine the level of agreement among local informants concerning the use of medicinal plants for various ailment categories. The ICF values ranged from 0.904 for digestive issues to 0.947 for hair problems, which are relatively high but reflect the shared traditional knowledge of the area communities, as participants were generally aware of multiple plants for common ailments. Categories including hair problems (0.947), eye disorders (0.923), fever and typhoid (0.931), kidney/urinary problems (0.918), anti-helminthic (0.918), and heart and

blood circulation (0.931) showed particularly strong agreement, demonstrating that the reported medicinal plants are both widely known and reliably used within the community.

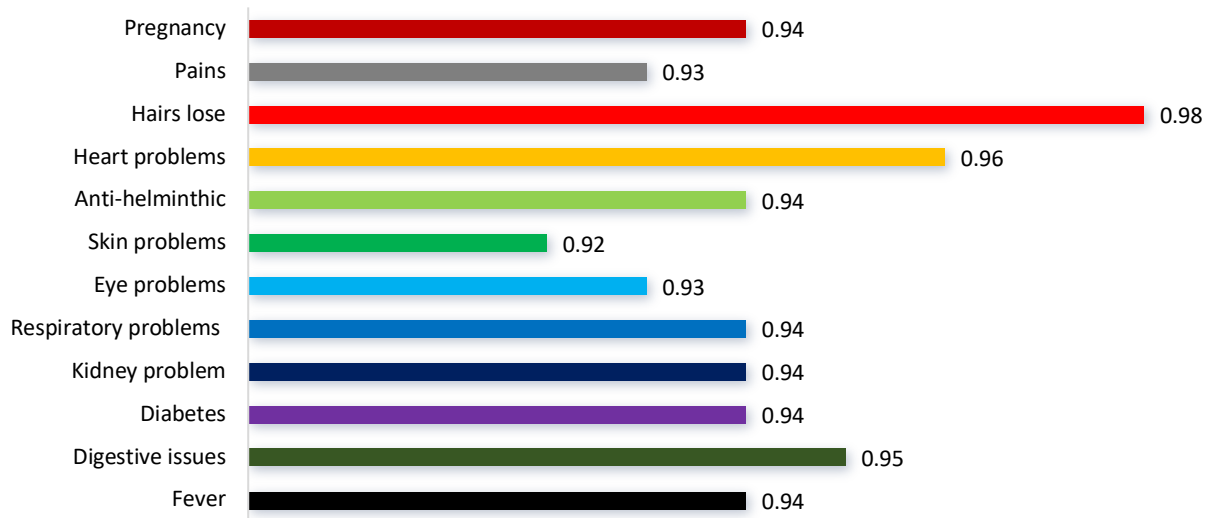


Figure 4. Medicinal plants showed the highest consensus among informants

Statistical Analyses of Ethnobotanical Knowledge

Chi-square tests revealed significant associations between socio-demographic factors and ethnobotanical knowledge in the area. Gender was highly associated with plant knowledge ($\chi^2 = 250$, $df = 1$, $V = 1$, $p < 0.001$). Male informants predominantly reporting expertise in agriculture, livestock, medicinal, and cultural plant uses, while female participants focused mainly on domestic, culinary, and medicinal applications. Ethnicity also showed a strong effect ($\chi^2 = 234$, $df = 18$, $V = 1$, $p < 0.001$), with Yousufzai and Shponkie informants possessing broad knowledge of wild and medicinal plants, Gujjer and Kohistani focusing on fodder and pasture species, and Mian, Parache, and minor ethnic groups contributing localized or culturally specific knowledge. Generational differences were significant as well ($\chi^2 = 45$, $df = 4$, $V = 0.42$, $p < 0.001$), indicating that older participants retained more traditional knowledge compared to younger individuals. Occupation exerted a strong influence on plant knowledge ($\chi^2 = 120$, $df = 8$, $V = 0.52$, $p < 0.001$); farmers and shepherds had the most practical expertise, students and teachers provided limited cultural knowledge, and housewives contributed specialized domestic and medicinal insights. A strong negative correlation was observed between elevation and average temperature ($r = -0.92$, $p < 0.001$), reflecting the expected climatic gradient across the study area. Sample size was very strongly correlated with both male ($r = 0.97$, $p < 0.001$) and female counts ($r = 0.90$, $p < 0.001$). Male and female counts were also highly positively correlated ($r = 0.85$, $p < 0.001$), indicating consistent sampling across genders. Age was moderately correlated with knowledge score ($\rho = 0.60$, $p < 0.001$), showing that older informants retained more traditional ethnobotanical knowledge than younger participants as show in table 3.

One-way ANOVA revealed significant differences in both environmental and knowledge variables across groups. Mean elevations differed among the Tehsils ($F = 6.24$, $df = 5,24$, $\eta^2 = 0.56$, $p < 0.001$), as did average temperatures ($F = 8.12$, $df = 5,24$, $\eta^2 = 0.63$, $p < 0.001$), consistent with the observed strong negative correlation between elevation and temperature. Knowledge scores varied significantly by occupation ($F = 18.5$, $df = 5,294$, $\eta^2 = 0.24$, $p < 0.001$), with farmers exhibiting the highest ethnobotanical knowledge and students the lowest. Generational differences in knowledge scores were also significant ($F = 12.3$, $df = 2,297$, $\eta^2 = 0.15$, $p < 0.001$), highlighting the retention of traditional knowledge among older participants as show in table 3. The ethnobotanical knowledge in the Swat Valley influenced by a combination of socio-demographic, cultural, and environmental factors. Effect sizes ranged from moderate to very large ($V = 0.42-1$, $\eta^2 = 0.15-0.63$), indicating both practical and statistical significance as show in table 3.

Ethnobotanical Uses and Socioeconomic Significance

Fodder and Forage Plants

The majority of residents in the district, particularly those who live in its upper regions, are farmers who keep dairy cattle such as buffaloes, cows, goats, and sheep kept in their homesteads. Although dairy products provide both nutritional and

economic benefits, people utilize 120 of the district's 234 plant species as fodder, of which seven species are cultivated locally for livestock, of these, 113 species are harvested from the wild, as presented in Appendix 1. However, the Poaceae family, which includes 46 plants, was the most prevalent family utilized as fodder, whereas the remaining 74 species were distributed across 33 families, as shown in Appendix 1. The most common activity in the region was free grazing, where shepherds mostly used the pastures and arable fields to graze their sheep and goats. In response to our interview questions, a shepherd told us that his livestock spend the summer in Speen Sir (Kalam) and the winter in Charssada, Sama, Malakand, and other nearby areas for free pasture. *Apluda*, *Aristida*, *Arthraxon*, *Brachiaria*, *Cenchrus*, *Chrysopogon*, *Echinochloa*, *Hyparrhenia*, *Hordeum*, and *Phalaris* commonly used as fodder, as locals dry them (locally called "Pashkaly," meaning winter fodder harvesting) for use during winter, and some sell this dried fodder to others for additional income. The *Gujjar (Ajar)* communities primarily practice pasturing of livestock but also collect and store certain plants during specific seasons for winter use. Leaves of *Prunus* spp. are bulk-harvested and preserved for winter use, in contrast to the fresh leaves of *Morus*, *Melia*, *Celtis*, and *Ailanthus* spp., which are fed to goats and sheep during the summer season. These fodder and forage species are widely utilized around the world and hold considerable importance for the local livestock economy.

Table 3. Results of Chi-square, correlation, and ANOVA analyses for socio-demographic determinants of ethnobotanical knowledge.

Analysis	Variables	Statistic	df	Effect Size	p-value	Significance
Chi-square	Gender vs Knowledge Focus	$\chi^2 = 250$	1	V = 1	<0.001	Highly significant; males focus on agriculture, livestock, medicinal, and cultural, while females on domestic, culinary, medicinal
	Ethnicity vs Knowledge Focus	$\chi^2 = 234$	18	V = 1	<0.001	Strongly significant; each ethnic group has distinct knowledge patterns
	Age and Generation vs Knowledge Focus	$\chi^2 = 45$	4	V = 0.42	<0.001	Elders retain more traditional knowledge than youth
	Occupation vs Knowledge Focus	$\chi^2 = 120$	8	V = 0.52	<0.001	Occupation strongly influences knowledge; farmers and housewives differ from students and teachers
Correlation (r/p)	Elevation vs Avg Temp	r = -0.92	-	-	<0.001	Strong negative correlation; higher elevations are colder
	Sample Size vs Male count	r = 0.97	-	-	<0.001	Very strong positive correlation
	Sample Size vs Female count	r = 0.90	-	-	<0.001	Very strong positive correlation
	Male vs Female count	r = 0.85	-	-	<0.001	High positive correlation
	Age vs Knowledge Score	$\rho = 0.60$	-	-	<0.001	Moderate positive correlation; older participants have higher traditional plant knowledge
ANOVA	Elevation (m) across Tehsils	F = 6.24	5,24	$\eta^2 = 0.56$	<0.001	Mean elevations differ significantly between Tehsils
	Avg Temp (°C) across Tehsils	F = 8.12	5,24	$\eta^2 = 0.63$	<0.001	Mean temperatures differ significantly between Tehsils
	Knowledge Score by Occupation	F = 18.5	5,294	$\eta^2 = 0.24$	<0.001	Occupation significantly affects plant knowledge; farmers highest, students lowest
	Knowledge Score by Age Group	F = 12.3	2,297	$\eta^2 = 0.15$	<0.001	Older generations retain more knowledge than younger participants

Fuel-Wood Species

About 59 of the district's 234 plant species are utilized as fuel-wood due to the harsh winters and freezing temperatures, and it is often believed that the amount of fuel consumed per household in the study area exceeds that of food and other necessities. This study indicates that residents collect fuel-wood either before or during the winter months. Locals commonly fell several tree species for firewood, such as *Olea*, *Quercus*, *Grewia*, *Debregeasia*, *Prunus*, *Juglans*, *Azadirachta*, *Melia*, *Ailanthus*, *Ficus*, *Malus*, *Morus*, *Populus*, and *Pinus*. In addition, certain herb species like *Artemisia*, *Sisymbrium*, and *Cannabis sativa* serve as fuel for economically weaker households, while shrubs such as *Rhus continus*, *Astragalus oplites*, *Indigofera* spp., *Buddleja crispa*, *Myrsine africana*, *Desmodium elegans*, *Indigofera gerardiana*, *Sageretia thea*, and *Dodonaea viscosa* are also used as fuel by the local people. Over-cutting is causing the majority of commercially significant plants to disappear. *Quercus*, *Prunus*, *Pinus*, *Juglans*, and *Morus* all of which have high fuel value, are severely impacted, and their populations are decreasing in the region, some landowners grew trees such as *Melia*, *Ailanthus*, *Populus*, and *Morus* species. They then felled these trees, known locally as Khatrashi (cut trees and shrubs), and burned them for fuel before winter arrived. In the upper region, hillside dwellers gather wild plants and use them as fuel since they lack the financial means to buy LPG. In other cases, there is no LPG or other service for supplying fuel in the upper parts of the region. The local flora diversity is therefore considered to be seriously threatened by fuel-wood. This study revealed that fuel-wood usage is widespread and imposes significant pressure on residents and natural resources. The availability of natural gas in the area could reduce dependence on trees for fuel. **The** government of Khyber Pakhtunkhwa (KP) and Pakistan should provide natural gas or other alternative energy sources to help mitigate threats to both local security and environmental sustainability.

Timber and Thatching

Mud houses are frequently built in the upper region of the district. Consequently, approximately 19 of the district's 234 locally used plant species are employed in the construction of mud dwellings for furniture and timber purposes. Residents of the upper regions of the area constructed their houses by combination of mud, stone, and wood locally called "mud-houses". Plants have been an essential component of construction among indigenous communities. Therefore, a range of trees such as *Pistacia*, *Quercus*, *Cedrus deodara*, *Picea*, *Ailanthus*, *Juglans regia*, *Morus nigra*, and *Melia azedarach* were used for building materials and as sources of timber, particularly by low-income households. Locals can readily access these trees to meet their construction needs; however, they are among the most expensive timber resources in Pakistan, and illegal logging activities have negatively impacted their availability. Locals may readily rely on these trees to supply their requirements, but they are the costliest in Pakistan, and the timber mafia's activities have negatively impacted them. Even while several shrubby species, such as *Plectranthus rogosus*, *Myrsine africana*, *Indigofera heterantha*, and *Cotoneaster micro-phyllus*, were once used for roofing the buildings, delicate plants nevertheless thrived above the forests. In addition to being used to store clay beneath the clay cover, *Saccharum bengalense*, *Saccharum spontaneum*, and *Hyparrhenia hirta* were also used to build shelters, locally known as "Jompanra" or "Chopal," primarily in fish farms and local inns. Illegal timber activities have severely damaged the local vegetation, even though these plants were previously sufficient to meet community needs. **In Pakistan**, the market price for these trees has decreased dramatically in recent years. Efforts should be made to restore native vegetation to ensure sustainable use in the future. The natives employ a variety of plant components, including the leaves and branches of *Pinus roxberghii*, *Dodonaea viscosa*, *Justicia adhatoda*, and *Morus* spp., for roofing, thatching, and other uses. This is required since these plants need certain precautions.

Ornamental Plant Species

Locals of the area purchased ornamental plants from nurseries and then cultivate them in townships, parks (such as Fizagate Park, Wonderwall Park, and Dadahara Park), and private gardens and residences (Kabal Garden, locally known as Kabal Baghcha). Many plants are imported from various countries. Appendix 1 and Figure 4 indicate that approximately 28 of the district's 234 plant species are used for decorative purposes. Although they are not primarily utilized for commercial purposes, decorative plants can generate substantial revenue when purchased by locals for aesthetic use and sold by nursery operators. *Nerium indicum*, wild roses, *Onychium japonicum*, *Adiantum capillusveneris*, *Cynodon dactylon*, *Dodonaea viscosa*, *Daphne mucronata*, *Juniperus communis*, and *Robinia* spp., were among the wild flora that the majority of Swat residents utilized as decorations. According to Robert *et al.* (1995), several natural plants are used as decorations, such as *Senecio chrysanthemoides*, *Rosa moschata*, *Nerium indicum*, and *Jasminum humile*. Some species also attract honeybees with their beautiful blossoms. This may encourage beekeeping as a profitable endeavor. This contributes significantly to the preservation of native flora and the economic stability of local communities.

Plants Used In Fencing and Hedging

Approximately 9 plant species used for fencing and hedging in the area as shown in Appendix 1. The fencing in the area was made from species of *Opuntia dillenii*, *Acacia modesta*, *Robinia pseudoacacia*, *Berberis*, *Ziziphus*, *Zanthoxylum*, *Rubus*,

Cotoneaster, Rosa, Sageretia, and Punica species. Grazing livestock is an essential activity in the area, and local residents protect their agricultural crop fields by enclosing their fields with thorny, bushy, or prickly plants as natural barrier.

Plants Used In Making Agricultural Tools

Since the bulk of the population is rural and relied on typical wooden and iron implements for farming, they exploited wood plants to make agricultural equipment as shown in Appendix 1. According to Table 3, 19 plant species were documented for the production of agricultural tools such as knife handles, sickle handles, axe handles, pulleys, and other farming equipment. Table 4 shows that the species most frequently utilized for these purposes were *Morus* spp., *Olea ferruginea*, *Dalbergia sissoo*, and *Acacia nilotica*.

Plants visited by Honeybee Species

In the area, beekeeping is very common; as shown in Appendix 1, honeybees visit approximately 23 plant species. In the region, wild honeybee species are well-known. Plants that commonly attract honeybees in the region include *Trifolium repens*, *Indigofera heterantha*, *Papaver somniferum*, *Plectranthus rugosus*, *Rosa brunonii*, *Rosa webbiana*, *Nerium indicum*, *Gymnosporia royleana*, *Dalbergia sissoo*, *Bombax malabaricum*, and several others. Inhabitants of the area utilize honey harvested from wild beehives for both income generation and dietary purposes. Over the summer, several professional also visit the region and maintain bees in wooden hives. According to beekeepers and our results, highly valued in the region, with prices increasing annually. The price per kilogram of honey might ranges from 1500 to 3000 PKR, depending on its quality and purity.

Plants used in sports good manufacturing

Traditional sports such as cricket, gilli-danda, and hockey are widely played in the region. Due to financial constraints, especially among residents of remote areas, people rely on locally available wood instead of purchasing commercial sports gear. Wood from *Olea ferruginea*, *Populus alba*, *Populus caspica*, *Morus alba*, *Morus nigra*, and *Juglans regia* is commonly used to manufacture bats, wickets, hockey sticks, and gilli-danda. Locals prefer *Olea ferruginea* for gilli and danda because of its light weight, toughness, and resistance to cracking. *Morus alba* and *Morus nigra* are favored for hockey sticks due to their flexibility, whereas *Juglans regia*, *Populus alba*, and *Populus caspica* are used for cricket bats and stumps. Residents report that these species are selectively harvested, and the practice is perceived to cause little ecological harm.

Fruits and Vegetables

About 79 out of 234 plant species were utilized as a source of food. Of these, sixteen species were used as grains and spices, 21 as vegetables, and 42 as fruits. The results indicate that Swat is predominantly an agricultural region. According to Table 4, the region's inhabitants rely heavily on the economic contributions of farmed fruits, including popular varieties such as apples, pears, peaches, persimmons, grapes, plums, and apricots. Apples can be stored for only approximately six months; however, they possess significant commercial potential due to their high productivity. Although they have a relatively short shelf life, fruits such as pears, grapes, persimmons, plums, and apricots also exhibit considerable commercial value. Due to high market demand, residents continue to expand orchards in the region. Although pears and grapes are economically important, there is a need for varietal improvement. Similarly, walnuts, like almonds, are popular dry fruits with high market demand. Owing to their multipurpose use, walnuts have substantial commercial value. Furthermore, due to their excellent quality and ability to be stored for over a year, they are widely traded. Overall, the quality and diversity of these fruits are sufficient to support the local economy. Consequently, these fruits are traded at the Mingora Swat agricultural market, from where they are distributed and exported to other parts of the country.

Table 4. Major fruit species of Swat District and their production levels.

Fruits	Per Tree Annual production (Kg)	Price Per Kg (PKR)	Price Per Kg (USD)
Apple	100 to 120	100 to 250	0.3 to 0.94
Apricot	80 to 100	100 to 200	0.3 to 0.75
Peach	60 to 100	80 to 200	0.30 to 0.75
Plum	40 to 60	80 to 200	0.30 to 0.75
Grapes	50 to 70	150 to 250	0.56 to 0.94
Walnut	100 to 120	200 to 400	0.75 to 1.5

Naming of People and Places after Plants

Because the residents of the district maintain a strong cultural connection with plants, many communities bear names derived from plant species, and children are sometimes given plant-based names. The local community refers to certain plants by the following common names: Shamshad (*Buxus wallichiana*), Manrogay (*Myrtus communis*), Inzar Gul (the flower of *Ficus* spp.), Kashamali (*Ocimum basilicum*), and Sumbal (*Adiantum incisum*). Several village names in the district also originate from plants, for example Amlookdara (*Diospyros lotus*), Kabal (*Cynodon dactylon*), Shangla (*Euphorbia wallichii*), Totanubandi (*Morus* spp.), Salkhu Sir (*Rumex dentatus*), Manro (*Myrtus communis*), Naranj Pura (*Citrus* spp.), Spalmai (*Calotropis procera*), and Kharerai (mushroom). This naming was historically more prevalent in rural areas; however, with increasing modernization, it has become less common.

Plants Used For Other Purposes

Some plant species serve multiple utilitarian roles; for instance *Zea mays*, *Betula utilis*, and *Oryza sativa* provide dried branches used for cleaning kitchenware. *Polygonum barbatum* is widely employed in traditional fishing practices. *Olea ferruginea* is revered as a holy tree by the inhabitants of the area. *Tulipa clusiana* thrives in graveyards. Plants used for plastering mud walls include *Triticum aestivum* dust and *Oryza sativa* shoots. Brooms typically made from *Indigofera heterantha*, *Arthraxon prionodes*, *Saccharum bengalense*, and *Saccharum spontaneum*, while wooden tools are crafted from *Morus alba*, *Morus nigra*, and *Dalbergia sissoo*. As indicated in Appendix 1, several species including *Morus alba*, *Indigofera heterantha*, *Saccharum bengalense*, *Saccharum spontaneum*, *Hyparrhenia hirta*, *Wikstroemia canescens*, *Arisaema flavum*, and *Periploca aphylla* are traditionally used in the preparation of snuff.

Discussion

The present study documented substantial ethnobotanical diversity in the Swat Valley, encompassing 234 species across 185 genera and 74 families. This richness reflects the ecological diversity of the region and the strong relationship between local communities and plant resources. The dominance of herbaceous taxa (122 species) over trees (72 species) and shrubs (27 species) reflects patterns consistently reported from the Hindu Kush-Himalayan belt, where herbs are more accessible, regenerate quickly, and are therefore more frequently incorporated into traditional healthcare systems (Shinwari, 2010; Kunwar et al. 2013). This life-form distribution not only indicates ecological availability but also highlights adaptive knowledge systems that prioritize easily renewable plant resources. Socio-demographic variables emerged as critical determinants of ethnobotanical knowledge, with gender, occupation, age, and ethnicity significantly influencing knowledge distribution. The predominance of male knowledge in agriculture, livestock, and forest-based uses, contrasted with female specialization in domestic and medicinal domains, reflects a gendered division of ethnobotanical expertise that has been widely reported in traditional societies (Howard, 2003; Pfeiffer & Butz, 2005). Similarly, the higher knowledge retention among elders compared to younger generations indicates an ongoing erosion of traditional knowledge, a phenomenon increasingly attributed to modernization, formal education, and reduced dependence on natural resources (Reyes-García et al. 2013; Tang & Gavin, 2016). Occupational specialization further structured plant knowledge systems, with farmers and shepherds demonstrating the highest practical knowledge due to their continuous interaction with agro-pastoral landscapes, while students and formally educated individuals exhibited comparatively limited ethnobotanical familiarity (Shrestha & Dhillon, 2006; Ahmad et al. 2019). Ethnic variation in knowledge particularly among Yousufzai, Shponkie, Gujjer, and Kohistani groups—highlights the role of cultural traditions and livelihood strategies in shaping plant use patterns, reinforcing the concept that ethnobotanical knowledge is both culturally embedded and ecologically contextualized (Albuquerque et al. 2013). Multipurpose species such as *Morus alba*, *Pinus roxburghii*, and *Olea ferruginea* exemplify the multifunctional role of plants providing medicinal, nutritional, and economic benefits. Local reliance on forest and mountain vegetation for fuelwood, fodder, and construction mirrors broader ecological pressures reported throughout northern KP (Sher et al. 2014). This dependency reflects a typical mountain socio-ecological system in which rural livelihoods are strongly linked to forest ecosystem services and non-timber forest products (MEA, 2005; Shackleton & Pandey, 2014). Recent studies further indicate that climate change and increasing market demand are accelerating the depletion of medicinal plant resources in northern Pakistan (Abbas et al. 2020; Khan et al. 2022). The high proportion of medicinal plants (98 species) documented in this study confirms the central role of plant-based healthcare in rural communities, aligning with global estimates that approximately 80% of the world's population relies on traditional medicine for primary healthcare (WHO, 2013). The predominance of leaves (42%) as the most utilized plant part reflects sustainable harvesting practices, as leaf collection is generally less destructive than root or whole-plant extraction, a pattern similarly observed in ethnobotanical studies across South Asia (Giday et al. 2009; Kayani et al. 2015).

Quantitative ethnobotanical indices, particularly RFC and UV enabled standardization of cultural importance across species and identification of conservation priorities. These indices are widely applied in ethnobotany to evaluate species salience and prioritize conservation of culturally important taxa (Phillips & Gentry, 1993; Tardío & Pardo-de-Santayana, 2008). The integration of RFC, UV, FL, and ICF provides a comprehensive framework for distinguishing widely recognized species from those with specialized or localized importance. Species such as *Pinus wallichiana* (RFC 0.45, UV 0.70), *Berberis lycium* (RFC 0.38, UV 0.65), *Taxus wallichiana* (RFC 0.60, UV 0.90), and *Ephedra gerardiana* (RFC 0.55, UV 0.65) emerged as both widely cited and highly versatile. Notably, *Taxus wallichiana* is globally recognized as a source of the anticancer compound paclitaxel, underscoring the conservation importance of highly cited medicinal species (Cragg & Newman, 2005). The high Informant Consensus Factor (ICF) values (0.904-0.947) across ailment categories demonstrate a strong homogeneity of traditional knowledge within the community, suggesting that ethnomedicinal practices are well established and culturally validated. Such high consensus levels are often interpreted as indicators of bioactive potential and reliability of plant-based remedies, making these species strong candidates for pharmacological investigation (Heinrich *et al.* 1998; Trotter & Logan, 1986). The ethnobotanical knowledge observed in Swat shows both shared and distinctive patterns compared to other Pakistani regions. Medicinal plants comprise over 60% of documented species, comparable to the Karakoram and Western Himalayas (Ahmad *et al.* 2019). This proportion aligns with global estimates suggesting that a significant proportion of rural populations depend on plant-based medicines for primary healthcare (WHO, 2013). Unlike Gilgit-Baltistan, where alpine herbs such as *Rheum emodi* and *Saussurea lappa* dominate, Swat's traditional medicine relies on temperate and subtropical taxa including *Justicia adhatoda*, *Berberis lycium*, and *Adiantum capillus-veneris*. In contrast, Sindh and Balochistan show greater reliance on desert and coastal flora, reflecting lower medicinal plant diversity (Shinwari, 1993; Qureshi *et al.* 2010). These variations highlight the strong influence of ecological gradients and floristic composition on ethnobotanical knowledge systems (Albuquerque *et al.* 2013). The temperate forests of Swat provide a uniquely balanced resource base, supporting a broad spectrum of ethnobotanical applications from construction and household crafts to medicinal use. Such erosion is commonly linked to socio-economic transformations, urbanization, and reduced dependence on natural resources (Reyes-García *et al.* 2013; Tang & Gavin, 2016).

Swat's ethnobotany aligns with patterns observed in other biodiversity-rich mountainous regions, such as the Himalayas, Andes, Patagonia, and East Africa (Kala, 2015; Kunwar *et al.* 2013; Toledo *et al.* 2020; Kamatenesi *et al.* 2011). Across these regions, communities depend on resilient, multipurpose species for fuel, medicine, and construction, often shaped by ecological constraints and cultural traditions. In Swat, species such as *Pinus wallichiana*, *Taxus wallichiana*, and *Ephedra gerardiana* serve analogous roles to conifers and alpine herbs in the Andes, reflecting convergence in mountain ethnobotanical strategies (Reyes-García *et al.* 2013; Salerno *et al.* 2015). This convergence suggests independent adaptive responses to similar environmental pressures rather than direct cultural exchange. Despite such similarities, community-based conservation and co-management strategies—successfully implemented in other regions remain limited in Swat and should be prioritized for sustainable resource management (Berkes, 2009; Oldekop *et al.* 2016).

High citation frequencies of key Swat species correspond closely with documented bioactive compounds, providing pharmacological support for traditional uses. *Pinus wallichiana* (RFC 0.45, UV 0.70) is employed for respiratory ailments, antiseptic purposes, bone healing, timber, and rituals. Its phytochemistry, including α -pinene, β -pinene, and lignans, exhibits anti-inflammatory, antimicrobial, and antioxidant properties (Singh *et al.* 2019; Khan *et al.* 2021). Similarly, *Berberis lycium* (RFC 0.38, UV 0.65) is used for gastrointestinal, hepatic, and dermatological disorders, with berberine, palmatine, and berbamine providing antimicrobial, hepatoprotective, and antidiabetic effects (Patel *et al.* 2020). Other species, including *Azadirachta indica*, *Withania somnifera*, *Mentha longifolia*, *Curcuma longa*, and *Nigella sativa*, also demonstrate strong concordance between traditional use and bioactive compounds. This agreement between ethnobotanical knowledge and phytochemical evidence highlights the value of traditional medicine as a foundation for modern drug discovery and bioprospecting (Fabricant & Farnsworth, 2001; Atanasov *et al.* 2015).

Gender Influence on Ethnobotanical Knowledge

In this study, a significant gender imbalance was observed among informants, with 250 males and 50 females. This is largely due to local cultural norms (Parda), which restrict women's participation in public interviews. Consequently, certain areas of ethnobotanical knowledge particularly women-specific plant uses such as midwifery, household remedies, and domestic healthcare may be underrepresented in the dataset. Similar patterns have been documented in ethnobotanical research in culturally conservative regions, where female knowledge is often less accessible to researchers (Pironi *et al.* 2005). This limitation shows the need for culturally sensitive study approaches that facilitate female participation, such as gender-matched interviewers or private household interviews. Recognizing this gap is crucial, as women's knowledge often contributes significantly to healthcare practices and the sustainable use of local plant resources.

Generational Differences in Ethnobotanical Knowledge

This study revealed significant generational disparities in ethnobotanical knowledge among the inhabitants of Swat. Elder aged informants (50-90 years) exhibited the highest level of expertise, with 90-95% recognizing key plant species and 85-95% possessing comprehensive knowledge of their uses. Adults aged 30-50, years primarily farmers and shepherds retained moderate familiarity, recognizing 75-85% of key species and demonstrating ethnobotanical knowledge in 70-80% of cases. In contrast, younger individuals 20-30 years showed a notable decline with only 50-60% recognizing major species and 45-55% aware of their traditional uses. This decline reflects reduced engagement with natural resources due to modernization, changing lifestyles, and limited exposure to traditional practices. The observed age-related gradient emphasizes the urgency of documenting and preserving indigenous plant knowledge through intergenerational transmission, community-based learning, and integration into educational curricula. Sustained cultural and ecological awareness programs could play a pivotal role in maintaining Swat’s ethnobotanical heritage while ensuring that this traditional wisdom continues to inform sustainable biodiversity management and rural healthcare practices.

Table 5. Differences in ethnobotanical knowledge across generations.

Age-Group	Number of Informants	% Recognizing Key Plant Species	% Possessing Ethnobotanical Knowledge	Key Observations
Youth (20-30)	50	50-60%	45-55%	Primarily students; limited awareness; modernization has reduced engagement with traditional knowledge
Adults (30-50)	100	75-85%	70-80%	Adults retain moderate knowledge; actively use some plant resources
Elders (50-90)	150	90-95%	85-95%	Elders possess extensive knowledge; primary custodians of ethnobotanical knowledge

Usage-Conservation Paradox of Key Plant Species

This study identified numerous plant species of high cultural, medicinal, and economic importance. Their RFC and UV reflect their significance to local communities as well as their susceptibility to over-exploitation. Species with high UV and RFC are particularly vulnerable, illustrating the usage-conservation paradox, where the most valued species face the greatest conservation pressures (Kala 2005; Shinwari 2010; Ahmad *et al.* 2014; Bussmann *et al.* 2018). *Taxus wallichiana* (RFC = 0.60; UV = 0.90), classified as Endangered (EN), demonstrates clearly illustrates this relationship. Although heavily relied upon for medicinal purposes and timber, unsustainable harvesting has caused a sharp population decline. Similarly, *Ephedra Gerardiana* (RFC = 0.55; UV = 0.65) and *Valeriana jatamansi* (RFC = 0.35; UV = 0.50) are Vulnerable, with root and rhizome extraction threatening natural regeneration. Immediate interventions including in-situ conservation, regulated harvesting, ex-situ cultivation, and community awareness programs are required to prevent further population loss (Kala 2005; Shinwari 2010). Forest species such as *Cedrus deodara* (RFC = 0.50; UV = 0.75) and *Abies pindrow* (RFC = 0.48; UV = 0.72) face declines from timber collection and fuelwood extraction, while *Pinus wallichiana* (RFC = 0.45; UV = 0.70) is locally vulnerable. Sustainable management practices, including community-based conservation, plantation programs, and regulated harvesting, are necessary to safeguard these forest resources (Shinwari 2010; Bussmann *et al.* 2018). Other culturally important trees, shrubs, herbs, and grasses, such as *Punica granatum*, *Ricinus communis*, *Achyranthes aspera* and *Cymbopogon jwarancusa* are currently Least Concern, but localized harvesting and habitat pressures highlight the need for community-based sustainable use, propagation, and education programs.

Table 5. Ethnobotanical importance, conservation status, and management recommendations for key plant species in the study area.

Species	RFC	UV	IUCN Red List Status	Local Abundance Trend	Main Threats	Conservation Recommendation
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<i>Taxus wallichiana</i>	0.60	.90	Endangered	Declining	Overharvesting for medicinal use & timber	In-situ protection, regulated harvesting, propagation programs
<i>Ephedra gerardiana</i>	0.55	0.65	Vulnerable	Declining	Root harvesting for medicine	Ex-situ cultivation, harvest regulation
<i>Valeriana jatamansi</i>	0.35	0.50	Vulnerable	Declining	Rhizome extraction	Cultivation, community awareness
<i>Cedrus deodara</i>	0.50	0.75	Near Threatened	Decreasing	Timber collection, habitat loss	Community forest management, afforestation, sustainable harvest
<i>Pinus wallichiana</i>	0.45	0.70	Least Concern	Locally vulnerable	Fuelwood and timber collection	Plantation programs, regulated harvesting
<i>Abies pindrow</i>	0.48	0.72	Least Concern	Declining	Timber and resin collection	In-situ protection, cultivation trials
<i>Juniperus communis</i>	0.40	0.65	Least Concern	Decreasing	Fuelwood, overharvesting for medicinal use	Community-based sustainable use, replanting
<i>Cupressus sempervirens</i>	0.42	0.70	Least Concern	Stable but limited	Timber and ornamental collection	Controlled propagation, urban planting
<i>Punica granatum</i>	0.58	0.85	Least Concern	Stable, local pressure	Fruit and wood collection	Cultivation, seed dispersal programs, agroforestry
<i>Ricinus communis</i>	0.55	0.80	Least Concern	Declining locally	Harvest for medicinal & industrial use	Ex-situ propagation, controlled collection
<i>Berberis lyceum</i>	0.38	0.65	Least Concern	Declining	Fruit and medicinal bark harvesting	Cultivation, sustainable harvesting guidelines
<i>Ziziphus jujuba</i>	0.36	0.60	Least Concern	Stable	Fruit collection, grazing pressure	Community awareness, propagation
<i>Achyranthes aspera</i>	0.50	0.60	Least Concern	Stable	Occasional medicinal harvesting	Sustainable collection, education programs
<i>Plantago lanceolata</i>	0.52	0.63	Least Concern	Stable	Grazing and medicinal use	Community-based harvesting, propagation
<i>Cuscuta reflexa</i>	0.30	0.45	Least Concern	Declining	Over-collection for medicine	Cultivation, propagation
<i>Saccharum spontaneum</i>	0.25	0.35	Least Concern	Stable	Fodder harvesting	Managed harvesting, local awareness
<i>Cymbopogon jwarancusa</i>	0.28	0.40	Least Concern	Stable	Fodder and traditional use	Sustainable harvest, community protection
<i>Morus alba</i>	0.48	0.70	Least Concern	Declining	Timber, fruit collection, sports tools	Cultivation, regulated harvesting
<i>Olea ferruginea</i>	0.46	0.68	Least Concern	Declining	Timber, sports tools, fuelwood	Plantation, agroforestry,

						community protection
<i>Dalbergia sissoo</i>	0.44	0.65	Least Concern	Declining	Timber and tool production	In-situ protection, sustainable plantation

Conclusion

This study demonstrated that gathering and utilizing indigenous plants remains an important activity in the study area. Numerous local species identified and recorded in distinct places, highlighting regional variations. These sites have a common cultural legacy when it comes to collecting native plants. The younger generation has experienced a notable decline in traditional knowledge as a result of adopting modern Western lifestyles. A total of 234 plant species including 74 families and 185 genera were found in the area. These plants are essential to the local population for a variety of purposes. Despite this, it is acknowledged that traditional ethnobotanical knowledge held by community elders is dynamic and influenced by ethnic factors as well as interactions with external cultural influences and modern knowledge systems. In general, the current study offers a thorough understanding of the traditional knowledge of native plant species and their ethnobotanical applications. Efforts are needed to preserve traditional ethnobotanical knowledge among younger generations and reduce human pressure on natural ecosystems. Native residents rely largely on indigenous plant species and the traditional ethnobotanical knowledge of the plant species documented through local knowledge provide valuable scientific data. The reduced collection of wild edible plants is driven by various factors, including socioeconomic conditions, evolving agricultural practices, easier availability of commercial produce, and changing attitudes. Notably, many middle-aged residents associate the use of wild plants with poverty from earlier times. Numerous significant plant species in the area are vanishing at a startling rate according to the field study and previous studies these plants need urgent conservation efforts.

Policy Implications and Practical Recommendations

The effective conservation and sustainable uses plant resources in the Swat region require a multi-level approach that integrates governmental policies, community participation, and scientific guidance. This study highlights several measures that can be implemented to address the identified issues:

1. The provincial government of Khyber Pakhtunkhwa (KP) and the federal government of Pakistan should formulate clear policies for the protection of biodiversity hotspots, including regulations on the collection and use of medicinal and fuel-wood plants. Enforcement mechanisms, such as monitoring illegal harvesting and controlling overexploitation, are essential to ensure compliance.
2. To reduce pressure on forests, authorities can facilitate the provision of clean and alternative energy sources (e.g., natural gas, LPG, or renewable energy) to local households. This will minimize the widespread use of fuel-wood and allow forests to regenerate naturally, thereby preserving regional biodiversity.
3. Local communities should be actively involved in conservation efforts. Awareness campaigns, educational workshops, and participatory programs can encourage sustainable harvesting and resource management practices, such as rotational collection and growing medicinal plants in home gardens. Communities can serve as local stewards, helping to monitor and protect key plant species.
4. This study recommends domestication and cultivation of high-demand medicinal plants to reduce extraction from the wild. Guidelines for sustainable harvesting, including harvesting only mature plants, leaving part of the population intact, and avoiding root destruction can help maintain healthy plant populations.
5. Preserving traditional ethnobotanical knowledge (TEK) is critical for both cultural heritage and sustainable use. Establishing community-based databases, educational materials, and collaborations with universities or research institutions can ensure that this knowledge is documented, updated, and applied responsibly in conservation initiatives.
6. Continuous scientific research and ecological monitoring are required to assess the effectiveness of implemented policies. Data on plant population trends, habitat health, and community compliance can guide adaptive management and future policy adjustments.
7. Integrating government support, community participation, scientific research, and traditional knowledge can ensure the long-term conservation and sustainable use of the region's biodiversity while supporting local livelihoods and cultural practices.

Declarations

Ethical Approval and Consent to Participation: Prior informed consent was obtained from all participants before conducting interviews and collecting ethnobotanical information. The purpose of the study and its significance for scientific research and community welfare were clearly explained to all respondents.

Data Availability: All data generated or analyzed during this study are included in the main body of the manuscript.

Consent for Publication: All authors have reviewed and approved the final manuscript and agreed to its publication.

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Authors' contribution: Shujat Ali conceptualized the study, conducted fieldwork, collected and analyzed data, and prepared the manuscript. Sayed Afzal Shah verified plant identification and offered technical guidance throughout the research. Salahud Din contributed to data interpretation and provided input during manuscript development. The study was primarily executed by Shujat Ali, with all co-authors providing advisory and editorial support. All authors have read and approved the final version of the manuscript.

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Appendix 1. Ethnobotanical uses of the selected plant species in the study area

Botanical name	Voucher number	Family	Local name	Habitat	Plant use purposes	FC	RFC	UV	FL (%)
<i>Dicliptera roxburghiana</i> Nees	SA-0081	Acanthaceae	-	Herb	i. Used as fodder	35	0.12	0.15	100
<i>Justicia adhatoda</i> L.	SA-00123	Acanthaceae	Baikar	Shrub	i. Leaves infusion used for fever and hepatitis ii. Honeybee species and also used as fuel	120	0.40	0.45	90
<i>Adiantum capillus-veneris</i> L.	SA-0010	Adiantaceae	Sumbal	Fronds	i. Leaves decoction used for hepatitis ii. Used as Ornamental plant	60	0.20	0.20	100
<i>Onychium japonicum</i> (Thunb.) Kze	SA-00144	Adiantaceae	Fern	FronD	i. Ornamental	80	0.27	0.30	90
<i>Trianthema portulacastrum</i> L.	SA-00221	Aizoaceae	Ghanay	Herb	i. Used vegetable ii. Used as Fodder	70	0.23	0.25	100
<i>Achyranthes aspera</i> L.	SA-009	Amaranthaceae	Jishkay	Herb	i. Leaves decoction used as diuretic to remove Kidney stone. ii. Whole plant used as fodder	110	0.37	0.50	85
<i>Amaranthus spinosus</i> L.	SA-0017	Amaranthaceae	Chalway	Herb	i. Leaves infusion used for heart diseases ii. Young shoot cooked as vegetable 3. Whole plant used as fodder	100	0.33	0.40	80
<i>Amaranthus viridis</i> L.	SA-0018	Amaranthaceae	Chalway	Herb	i. Leaves infusion used for constipation and carminative ii. Young shoot cooked as vegetable iii. Whole plant used as fodder	95	0.32	0.35	85
<i>Celosia argentea</i> L.	SA-0048	Amaranthaceae	Charkwala	Herb	i. Grown as ornamental plant	80	0.27	0.30	90
<i>Digera muricata</i> (L.) Mart.	SA-0082	Amaranthaceae	Sur Gulay	Herb	i. Used as vegetable ii. Fodder	40	0.13	0.15	100
<i>Narcissus tazetta</i> L.	SA-00138	Amaryllidaceae	GuliNargas	Herb	i. Bulb decoction used for Pregnancy termination ii. Honeybee species.	60	0.20	0.22	100
<i>Pistacia chinensis</i> Bunge	SA-00158	Anacardiaceae	Shnay	Tree	i. Stem bark infusion used for curing jaundice and liver diseases ii. Fuel wood	60	0.20	0.22	100
<i>Eryngium caeruleum</i> M.Bieb.	SA-0096	Apiaceae	PeshoPanja	Herb	i. Young shoot eaten as raw ii. Used as Fodder	50	0.17	0.20	100
<i>Scandix pecten-veneris</i> L.	SA-00203	Apiaceae	Gangahy	Herb	i. Young shoot eaten as raw ii. Used as fodder	60	0.20	0.22	100
<i>Nerium indicum</i> Mill.	SA-00140	Apocynaceae	Ganderai	Shrub	i. Extracted latex used for skin poxes	40	0.13	0.15	100

<i>Arisaema flavum</i> Schott	SA-0022	Araceae	Marjarai	Shrub	ii. It is ornamental. Honey bee species. i. It is also believed to help in tracing bears	55	0.18	0.20	100
<i>Hedera nepalensis</i> K. Koch.	SA-00108	Araliaceae	Da WanoKalay	Climber	i. Leaves infusions used as anticancer ii. Ornamental	70	0.23	0.25	100
<i>Periploca aphylla</i> Dcne	SA-00151	Asclepiadaceae	Barara	Shrub	i. Stem juice used for fever ii. Its ash used in snap	70	0.23	0.25	100
<i>Aloe vera</i> (L.) Burm. f.	SA-0015	Asphodelaceae	Kamal Panra	Herb	i. Leaves juice used as hair tonic and for diabetes ii. Used as Ornamental plant	140	0.47	0.50	100
<i>Artemisia scoporia</i> Waldst and Ket.	SA-0024	Asteraceae	Jawkay	Shrub	i. Direct chewing of root bark used effective in fever, colic, boils and scabies ii. Shoots are used for making brooms for sweeping lawns and roofs of muddy houses, also used in making edges of mud roofs	80	0.27	0.35	90
<i>Bidens biternata</i> (Lour.) Merr. and Sherff	SA-0033	Asteraceae	Surmal	Herb	i. Whole plant used fresh fodder and also dry it to store for offseason	40	0.13	0.15	100
<i>Calendula arvensis</i> L.	SA-0038	Asteraceae	ZiarGulay	Herb	i. Shoot infusion used for diaphoretic and anthelmintic. ii. It is Honey bee plant	80	0.27	0.30	90
<i>Calendula officinale</i> L.	SA-0039	Asteraceae	ZiarGulay	Herb	i. Shoot powder used for wound healing ii. It is an honey bee plant	40	0.13	0.15	100
<i>Conyza canadensis</i> Conquist	SA-0062	Asteraceae	Wrajaky	Herb	i. Seed powder used as homeostatic, stimulant, diuretic, astringent. ii. Used as fodder	65	0.22	0.25	100
<i>Lactuca abietina</i> (Boiss. & Balansa) Bornm.	SA-00124	Asteraceae	-	Herb	i. Usedas salad ii. Fodder	40	0.13	0.15	100
Linn.	SA-00109	Asteraceae	Namarparas	Herb	i. Seed direct or raw consumption used as laxative and diuretic ii. Ornamental	60	0.20	0.22	100
<i>Silybum marianum</i> (L.) Gaertn.	SA-00207	Asteraceae	Wrejaki	Herb	i. Seed eaten raw ii. used as Fodder	50	0.17	0.20	100
<i>Sonchus asper</i> (L.) Hill	SA-00210	Asteraceae	ZiarGulay	Herb	i. Used Fodder	80	0.27	0.30	90
<i>Tagates minuta</i> L.	SA-00216	Asteraceae	Hamisha	Herb	i. Used as fragrant and as ornamental.	30	0.10	0.10	100
<i>Berberis lyceum</i> Royle.	SA-0030	Berberidaceae	Kwary	Shrub	i. Powder of stem bark used for wounds, gingivitis, and as refrigerant.	80	0.27	0.30	90

					ii. Used in fencing and hedges especially against porcupines.				
<i>Berberis vulgaris</i> L.	SA-0031	Berberidaceae	Kawary	Shrub	1. Powder of stem bark used for wounds, gingivitis, and as refrigerant ii. fruits edible iii. Used as fencing for garden	65	0.22	0.25	100
<i>Alnus nitida</i> (Spach.) Endl.	SA-0014	Betulaceae	Geiray	Tree	i. Leaves powder with water used to relieve pain ii. Wood is used as fuel, also used for making agriculture appliances.	110	0.37	0.40	95
<i>Betula utilis</i> D. Don	SA-0032	Betulaceae	-	Tree	i. Crushed fruit used for thalassaemia, constipation, stomach, carminative and piles. ii. Wood is used for making agricultural tools, utensils, fences	55	0.18	0.20	100
<i>Cynoglossum glochidiatum</i> Wall. ex Benth	SA-0066	Boraginaceae	Pachay	Herb	i. Used as fodder	50	0.17	0.20	100
<i>Cynoglossum lanceolatum</i> Forssk.	SA-0067	Boraginaceae	Ghatgulay	Herb	i. Used as fodder	60	0.20	0.22	100
<i>Heliotropium ovalifolium</i> Forssk.	SA-00110	Boraginaceae	Sharai	Herb	i. Used as vegetable Fodder	50	0.17	0.20	100
<i>Onosma hispida</i> Wall. ex G. Don	SA-00143	Boraginaceae	Abay Pai	Herb	i. Children suck its flower for its sweet taste ii. Fodder	60	0.20	0.22	100
<i>Capsella bursa-pastoris</i> (Linn.) Medic.	SA-0043	Brassicaceae	Alam	Herb	i. Seed taken with water for belly pain ii. Used as fresh fodder for cattle	75	0.25	0.30	90
<i>Cardamine hirsute</i> L.	SA-0044	Brassicaceae	Tarmera	Herb	i. Used as vegetable ii. Used as fodder for cattle	60	0.20	0.22	100
<i>Descurainia sophia</i> (L.)	SA-0077	Brassicaceae	Jenjar	Herb	i. Used as vegetable ii. Used as fodder	40	0.13	0.15	100
<i>Nasturtium officinale</i> R.Br.	SA-00139	Brassicaceae	Tarmera	Herb	i. Shoot infusion used for stomach ii. Used as vegetable iii. Fodder	90	0.30	0.35	85
<i>Raphanus sativus</i> L.	SA-00190	Brassicaceae	Tepar	Herb	i. Used as vegetable ii. Leaves used as fodder	90	0.30	0.35	85
<i>Sisymbrium altissimum</i> L.	SA-00209	Brassicaceae	Awary	Herb	i. Used as vegetable ii. Fresh shoot used as fodder and dry shoot used as fuel	150	0.50	0.55	100

<i>Sisymbriumirio</i> L.	SA-00208	Brassicaceae	Awary	Herb	i. Seed use for baby belly pain ii. Used as vegetable iii. Fresh shoot used as fodder and dry shoot used as fuel	150	0.50	0.55	100
<i>Buxus sempervirens</i> Hook. f.	SA-0037	Buxaceae	Shamshad	Tee	i. Making powder or infusion from leaves used for Diaphoretic ii. For wood carving and musical instruments	60	0.20	0.22	100
<i>Sarcococca saligna</i> Müll.Arg.	SA-00202	Buxaceae	Landnar	Shrub	i. Making powder from leaves used as blood purifier and to relieve muscular pain. ii. Fruit packing and honeybee plant.	50	0.17	0.20	100
<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	SA-00145	Cactaceae	Zoqam	Shrub	i. Edible fruit ii. Fencing for garden	40	0.13	0.15	100
<i>Canabis sativa</i> L.	SA-0042	Cannabaceae	Bhang	Herb	i. Leaves warming used for outer pain and fractures, and its infusion used for anodyne, narcotic, and tonic.	90	0.30	0.35	85
<i>Cana indica</i> L.	SA-0041	Cannaceae	Tasfabotay	Herb	i. It is an Ornamental plant and also used for making hedges.	200	0.67	0.90	100
<i>Capparis decidua</i> (Forssk.) Edgew	SA-001	Capparaceae	Kherha	Tree	i. Used as fuel wood	150	0.50	0.50	100
<i>Viburnum cotinifolium</i> D. Don	SA-00225	Caprifoliaceae	Chamyarai	Tree	i. Edible fruit ii. Used as fuel wood	40	0.13	0.15	100
<i>Gymnosporia royleana</i> Wall. ex Lawson in Hook.f.	SA-00107	Celastraceae	Sur Azghi	Shrub	i. Fruits powder used for male impotency ii. Honeybee species	40	0.13	0.15	100
<i>Chenopodium album</i> L.	SA-0054	Chenopodiaceae	Sarmay	Herb	i. Used as fodder ii. Used as vegetable	150	0.50	0.55	100
<i>Chenopodium murale</i> L.	SA-0053	Chenopodiaceae	Sarmay	Herb	i. Used as fodder	120	0.40	0.45	90
<i>Clematis grata</i> Wall.	SA-0058	Clemataceae	Ghrazela	Climber	i. Used as Fodder	35	0.12	0.15	100
<i>Commelina benghalensis</i> L.	SA-0059	Commelinaceae	Sheen Gulay	Herb	i. Used as Fodder	60	0.20	0.22	100
<i>Commelina paludosa</i> Blume	SA-0060	Commelinaceae	-	Herb	i. Used as Fodder	50	0.17	0.20	100
<i>Tradescantia pallida</i> (Rose) D.Hunt	SA-00220	Commelinaceae	-	Herb	i. Use as Ornamental plant	40	0.13	0.15	100
<i>Convolvulus arvensis</i> L.	SA-0061	Convolvulaceae	Prevata	Herb	i. Shoot infusion used as anti-dandruff ii. Used as fodder	70	0.23	0.25	100
<i>Ipomoea hederacea</i> (L.) Jacq.	SA-00116	Convolvulaceae	Speaker Gul	Herb	i. Used as Ornamental plant	90	0.30	0.35	85

<i>Ipomoea purpurea</i> (Linn.) Roth.	SA-00117	Convolvulaceae	Prewata	Herb	i. Used as Ornamental plant	40	0.13	0.15	100
<i>Cupressus sempervirens</i> L.	SA-0064	Cupressaceae	Sarwa	Tree	A cone mixed with wheat flour is traditionally used to promote fertility in cattle. ii. Used as Ornamental plant	40	0.13	0.15	100
<i>Juniperus communis</i> L.	SA-00122	Cupressaceae	Anja	Small tree	i. Used as Ornamental plant	95	0.32	0.35	85
<i>Thuja orientalis</i> L.	SA-00219	Cupressaceae	Sarwa	Tree	i. A cone mixed with wheat flour is traditionally used to promote fertility in cattle. ii. Use as Ornamental plant	30	0.10	0.10	100
<i>Cyperus alopecuroides</i> Rottb.	SA-0068	Cyperaceae	Wakha	Herb	i. Used as fodder	180	0.60	0.90	100
<i>Cyperus niveus</i> Retz.	SA-0069	Cyperaceae	Deela	Herb	i. Used as fodder	30	0.10	0.10	100
<i>Pycreus flavescens</i> (L.) Reichenb	SA-00183	Cyperaceae	-	Herb	i. Used as fodder	80	0.27	0.30	90
<i>Pycreus polystachyos</i> (Rottb.) P. Beauv	SA-00184	Cyperaceae	-	herb	i. Used as fodder	50	0.17	0.20	100
<i>Diospyros lotus</i> L.	SA-0086	Ebenaceae	Toor Amlook	Tree	i. Fruit effective in diarrhoea ii. Fruits edible iii. Leaves used as fodder and wood also usable in making agriculture tools	50	0.17	0.20	100
<i>Diospyros kaki</i> L.	SA-0087	Ebenaceae	Amlook	Tree	i. Fruits used as laxative ii. Fruits edible iii. Wood used as fuel.	40	0.13	0.15	100
<i>Elaeagnus parviflora</i> Wall. ex Royle	SA-0091	Elaeagnaceae	Ghanamrangay	Tree	i. Fruit edible ii. Used as fuel wood	150	0.50	0.55	100
<i>Euphorbia granulata</i> Forssk.	SA-0098	Euphorbiaceae	Preewatai	Herb	i. Fodder	120	0.40	0.45	90
<i>Acacia modesta</i> Wall.	SA-005	Fabaceae	Palusa	Tree	i. Gum used as tonic, also used for curing of dysentery, weakness, stimulant and demulcent ii. Leaves used as fodder for goats. It is also used in fencing, as fuel wood and honeybees species	200	0.67	1.00	90
<i>Acacia nilotica</i> (L.) Delile	SA-006	Fabaceae	Kikar	Tree	i. Its wood used for agriculture tools, furniture and fuel	50	0.17	0.20	100
<i>Albizia lebbek</i> (L.) Benth.	SA-00192	Fabaceae	Kikar	Tree	i. Flower juice used for debilities ii. Fuel wood, ornamental, fodder for goats, also used in fencing and honey bee species.	120	0.40	0.45	90

<i>Astragalus oplites</i> Benth. ex Parker	SA-0027	Fabaceae	-	Shrub	i. Used as fuel wood in winter.	30	0.10	0.10	100
<i>Cassia fistula</i> L	SA-0045	Fabaceae	Amaltas	Tree	i. fruit edible ii. Used as Ornamental plant, also used as fuel wood and for making agriculture tools	40	0.13	0.15	100
<i>Dalbergia sissoo</i> DC.	SA-0074	Fabaceae	Shava	Tree	i. Used for making Furniture, sport goods and Honey bee	120	0.40	0.45	90
<i>Desmodium elegans</i> DC	SA-0078	Fabaceae	Talbahay	Shrub	i. Used as fodder ii. Used as fuel wood	70	0.23	0.25	100
<i>Indigofera gerardiana</i> Wall. ex Baker	SA-00114	Fabaceae	Ghowarija	Shrub	i. Leaves infusion use for pain ii. Used as fuel, for making baskets and other similar articles.	80	0.27	0.30	90
<i>Indigofera</i> spp	SA-00115	Fabaceae	Gedarghowag	Shrub	i. Flowers and leaves eaten raw ii. Dry wood used as fuel	70	0.23	0.25	100
<i>Lathyrus apacha</i> L.	SA-00125	Fabaceae	Chelo	Herb	i. Making powder from shoot used for wounds healing ii. Pods eaten as raw iii. Used as a fresh fodder	150	0.50	0.55	100
<i>Lathyrus sativus</i> L.	SA-00126	Fabaceae	Chelo	Herb	i. Pods used as raw food iii. Used as a fresh fodder	60	0.20	0.22	100
<i>Lespedeza juncea</i> (L.F) Persoon	SA-00127	Fabaceae	Ormaray	Herb	i. Shoot infusion used for skin diseases ii. Fodder	70	0.23	0.25	100
<i>Pisum sativum</i> Linn.	SA-00159	Fabaceae	Matar	Herb	i. Used as vegetable ii. Honey bee species	100	0.33	0.35	85
<i>Robinia pseudoacacia</i> L.	SA-00191	Fabaceae	Kikar	Tree	i. Flower juice used for diabetes ii. Used as fuel wood andalso a honeybee species	40	0.13	0.15	100
<i>Trifolium repens</i> L.	SA-00222	Fabaceae	Showtal	Herb	i. Crushed seed used for pimple ii. Young shoot used as vegetable	60	0.20	0.22	100
<i>Vicia hirsuta</i> (L.) Gray	SA-00226	Fabaceae	Paley	Herb	i. its Pods is edible ii. Used as fodder	150	0.50	0.55	100
<i>Vicia monantha</i> Retz.	SA-00227	Fabaceae	Paley	Herb	i. its Pods is edible ii. Used as fodder	60	0.20	0.22	100
<i>Vicia sativa</i> L.	SA-00228	Fabaceae	MarghayKhpa	Herb	i. its Pods is edible ii. Used as fodder	50	0.17	0.20	100

<i>Vicia tetrasperma</i> (L.) Schreb.	SA-00229	Fabaceae	Paley	Herb	i. its Pods is edible ii. Used as fodder	120	0.40	0.45	90
<i>Quercus baloot</i> Griff.	SA-00187	Fagaceae	Banj	Tree	i. Fruits with water or direct eating used for urinary track ii. Timber, fuel wood, making agricultural tools specially	70	0.23	0.25	100
<i>Quercus dialatata</i> Lindle ex Royle	SA-00188	Fagaceae	Banj	Tree	i. Fruits with water or direct eating used for urinary track ii. Wood is used in agricultural tools, handles of plough, axes, gun, butts and walking sticks.	50	0.17	0.20	100
<i>Quercus incana</i> Roxb.	SA-00189	Fagaceae	Banj	Tree	i. Fruits with water or direct eating used for urinary track ii. Timber, used as fuel wood and for making agricultural tools	60	0.20	0.22	100
<i>Fumaria vaillantii</i> var. <i>indica</i> Hausskn.	SA-00102	Fumaricaceae	Krachai	Herb	i. Leaves infusion used for cough and belly pain ii. used as fodder	50	0.17	0.20	100
<i>Gentiana kurroo</i> Royle.	SA-00105	Gentianaceae	-	Herb	i. Root infusion used as tonic, for ulcer, and febrifuge ii. Used for fattening of horses.	95	0.32	0.35	85
<i>Swertia cordata</i> (G. Don) Clarke	SA-00215	Gentianaceae	Cherat Botay	Herb	i. used as fodder for cattle	40	0.13	0.15	100
<i>Parrotiopsis jacquemontiana</i> (Dcne) Rehder.	SA-00149	Hamamelidaceae	Beranj	Tree	i. Agricultural tools making	80	0.27	0.30	90
<i>Aesculus indica</i> (Wall. ex. Camb.) Hk.f.	SA-0011	Hippocastanaceae	Jawaz	Tree	i. Fruits powder with black tea used for pregnancy ii. Leaves are used as fodder, Wood is used in making furniture, agricultural appliances and gun butts	95	0.32	0.35	80
<i>Iris germanica</i> L.	SA-00118	Iriaceae		Herb	i. Shoot used medicinally for animals ii. People likes its flower	60	0.20	0.22	100
<i>Juglans regia</i> L.	SA-00121	Juglandaceae	Ghoz	Tree	i. Bark used as toothpaste and its juice used for warm ii. Dry fruit iii. Fuel and furniture	80	0.27	0.30	90
<i>Leucas cephalotes</i> Spreng.	SA-00128	Lamiaceae	-	Herb	i. Fodder	50	0.17	0.20	100
<i>Micromeria biflora</i> (Ham.) Bth.	SA-00134	Lamiaceae	-	Herb	i. Fodder	180	0.60	0.90	100
<i>Origanum vulgare</i> L.	SA-00146	Lamiaceae	Samakay	Herb	i. Shoot powder used for fever and typhoid ii. Used as fresh fodder.	120	0.40	0.45	90

<i>Plectranthus rogosus</i> P.I.Forst.	SA-00163	Lamiaceae	Speraky	Shrub	i. Flower juice used for eye infections and powder or infusion of leaves used for fever ii. Thatching and honeybee species.	30	0.10	0.10	100
<i>Tulipa clusiana</i> DC	SA-00224	Liliaceae	Ganderi	Herb	i. Shoot infusion used for fever ii. grow in grave and honey bee species	30	0.10	0.10	100
<i>Bombax malabaricum</i> DC.	SA-0034	Malvaceae	Sumbal	Tree	i. used as fuel wood, Honeybee species, making furniture and sport goods	50	0.17	0.20	100
<i>Malva neglecta</i> Wall.	SA-00130	Malvaceae	Panirak	Herb	i. Shoot infusion used for constipation ii. Young shoot used as vegetable iii. It is used a pot herb. It is also ornamental.	80	0.27	0.30	90
<i>Grewia asiatica</i> L.	SA-00106	Malvaceae4	Pastoney	Tree	i. leaves infusion used as antidiabetic ii. Used as fuel wood. Branches are used as a thatching material. ii. Leaves are also used as a source of fodder	30	0.10	0.10	100
<i>Marsilea minuta</i> L.	SA-00132	Marsilleaceae	NA	Herb	i. Young shoot used as vegetable ii. Fodder for sheep	60	0.20	0.22	100
<i>Marsilea quadrifolia</i> L.	SA-00131	Marsilleaceae	NA	Herb	i. Young shoot used as vegetable ii. Fodder for sheep	40	0.13	0.15	100
<i>Azadirachta indica</i> A. Juss.	SA-0029	Meliaceae	Bekanra	Tree	i. Used as Fuel wood, Honeybee and furniture	150	0.50	0.55	100
<i>Cedrella serrata</i> Royle.	SA-0046	Meliaceae	Skhawoonay	Tree	i. Used as timber wood for making furniture and also used as fuel wood	50	0.17	0.20	100
<i>Melia azedarach</i> L.	SA-00133	Meliaceae	Tora Bikanra	Tree	i. Bark infusions used for diabetes and fruits powder used for eyes infection ij]. Used for furniture andas fuel	120	0.40	0.45	90
<i>Ficus carica</i> Forssk	SA-0099	Moraceae	Inzar	Tree	i. Fruits are effective for constipation, stomach, carminative and piles ii. Edible fruit iii. Leaves used as fodder and Stem used as fuel wood.	180	0.60	0.90	100
<i>Ficus palmata</i> Forssk.	SA-00100	Moraceae	Inzar	Tree	i. Juice extracted from fruit as expectorant ii. Wood used as fuel	60	0.20	0.22	100
<i>Morus alba</i> L.	SA-00135	Moraceae	Tuth	Tree	i. Fruits effective for laxative, purgative, emollient ii. Edible fruit iii. Fodder, thatching, basket making.	150	0.50	0.55	100
<i>Morus nigra</i> L.	SA-00136	Moraceae	Tuth	Tree	i. Edible fruits ii. Fuel, sports goods, agricultural tools and fuel	170	0.57	0.85	100

<i>Myrsine Africana</i> L.	SA-00137	Myrsinaceae	Manragwaya	Shrub	i. Leaves infusion and direct uses of fruits cure hepatitis ii. Edible fruit iii. Used in mud roof thatching, fuel wood and fodder for goat.	50	0.17	0.20	100
<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G. Don	SA-0040	Myrtaceae	Botal brush	Tree	i. Used as fuel wood and also used for making agriculture tools	50	0.17	0.20	100
<i>Euclyptus globules</i> Labill	SA-0097	Myrtaceae	Laychii	Tree	i. Leaves juice used for asthma and stomach ii. Fuel wood, used for making furniture, beams and honey bee species	40	0.13	0.15	100
<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	SA-002	Myrtaceae	Lawang	Herb	i. Fruit powder with water used for eye disorder ii. Fruits used in Spice iii. It is used to make prickle.	120	0.40	0.60	83
<i>Jasminum grandiflorum</i> L	SA-00119	Oleaceae		Shrub	i. Leaves powder used as antihelmentic ii. Ornamental	50	0.17	0.20	100
<i>Jasminum humile</i> Linn.	SA-00120	Oleaceae	RambilChambil	Shrub	i. Root infusions used for worm ii. It is ornamental.	30	0.10	0.10	100
<i>Olea europaea</i> L.	SA-00141	Oleaceae	Khona	Tree	i. Leaves infusion used for toothache, mouth and gum diseases ii. Edible fruit iii. Wood used as Fuel and agriculture tools	30	0.10	0.10	100
<i>Olea ferrugenea</i> Royle	SA-00142	Oleaceae	Khona	Tree	i. Extracted oil used for rheumatism and body ache. Leaves infusion used for toothache, fever and sensitive teeth Holy tree, grown in shrines and grave yards. ii. Used for making agricultural tools, fuel wood. iii. Edible fruit	50	0.17	0.20	100
<i>Papaver somniferum</i> L.	SA-00148	Papaveraceae	Qash-Qash	Herb	i. Fruit with water used for chest infection, brain tonic, diarrhea ii. Ornamental and honey bee species	120	0.40	0.45	90
<i>Abies pindrow</i> Royle	SA-004	Pinaceae	Achar	Tree	i. Needle leaves used as tea substituent ii. Needle leaves are used for placing fruits in crates. ii. Cones used as fuel and for decoration purposes.	180	0.60	0.90	100
<i>Cedrus deodara</i> (Roxb. ex Lamb.) G. Don	SA-0047	Pinaceae	Dyar	Tree	i. Used timber wood for making bridges and construction purposes	30	0.10	0.10	100

<i>Picea smithiana</i> (Wall) Boiss	SA-00154	Pinaceae	Mangazaey	Tree	i. Needle infusion used for aheumatism and kidney stone. ii. Timber wood used in bridges, building houses, fuel wood and leaves are used to keep fruits in crates.	150	0.50	0.55	100
<i>Pinus gerardiana</i> Wall. ex. Lamb	SA-00155	Pinaceae	Changhozi	Tree	i. Edible dry fruit ii. Furniture and fuel wood	60	0.20	0.22	100
<i>Pinus roxbergii</i> Sarg.	SA-00156	Pinaceae	Nakhtar	Tree	i. Extracted gum use for poxes ii. Fuel wood, furniture	40	0.13	0.15	100
<i>Pinus wallichiana</i> L.	SA-00157	Pinaceae	Nakhtar	Tree	i. Needle infusion used as healing agent ii. Fuel wood, furniture	50	0.17	0.20	100
<i>Plantago lanceolate</i> L.	SA-00160	Plantaginaceae	Jabai	Herb	i. Leaves juice used for skin diseases ii. Used as vegetable iii. Fodder	50	0.17	0.20	100
<i>Plantago major</i> L.	SA-00161	Plantaginaceae	Jabai	Herb	i. Leaves juice used for skin diseases ii. Used as vegetable iii. Fodder	60	0.20	0.22	100
<i>Plantanus orientalis</i> L.	SA-00162	Platanaceae	Cheenar	Tree	i. It is used as anti-diabetic ii. Used as fuel wood and for furniture, leaves also used as fodder for goat and sheep	40	0.13	0.15	100
<i>Aeluropus lagopoides</i> (L.) Trin. ex Thwaites	SA-00153	Poaceae	Wakha	Herb	i. Fodder, grain eaten by birds	50	0.17	0.20	100
<i>Agrostis stolonifera</i> L.	SA-0012	Poaceae	Wakha	Herb	i. Whole plant used as fodder	70	0.23	0.25	100
<i>Alopecurus myosuroides</i> Huds.	SA-0016	Poaceae	Wakha	Herb	i. Whole plant used fresh fodder and also dry it to store for offseason	65	0.22	0.25	100
<i>Andropogon nardus</i> L.	SA-0019	Poaceae	Sargary	Herb	i. Used as mats in mosques. ii. Whole plant used fresh fodder and also dry it to store foroffseason	75	0.25	0.30	90
<i>Apluda mutica</i> L	SA-0021	Poaceae	Wakha	Herb	i. Whole plant used fresh fodder and also dry it to store for offseason	70	0.23	0.25	100
<i>Aristida adscensionis</i> L.	SA-0023	Poaceae	Wakha	Herb	i. widely used as fodder for cattle	60	0.20	0.22	100
<i>Arthraxon prionodes</i> (Steud.) Dandy	SA-0025	Poaceae	Maskanry	Herb	i. Use as broom and also used as fodder	40	0.13	0.15	100
<i>Arundo donax</i> L.	SA-0026	Poaceae	Naal	Herb	i. In old time it was used for writing Locally called Qalam	50	0.17	0.20	100
<i>Avena sativa</i> L.	SA-0028	Poaceae	Jamdari	Herb	i. Fruits powder used as tonic and aphrodisiac	90	0.30	0.35	85

					ii. Used as fodder for cattle				
<i>Brachiaria ramosa</i> (L.) Stapf	SA-0035	Poaceae	Shamokha	Herb	i. Used as fodder	30	0.10	0.10	100
<i>Bromus japonicus</i> Thunb	SA-0084	Poaceae	Wakha	Herb	i. Fodder	60	0.20	0.22	100
<i>Cenchrus ciliaris</i> L.	SA-0052	Poaceae	Pesholamay	Herb	i. Used as fodder	110	0.37	0.40	95
<i>Chrysopogon gryllus</i> (L.) Trin.	SA-0055	Poaceae	Wakha	Herb	i. Used as Fodder	80	0.27	0.30	90
<i>Chrysopogon serrulatus</i> Trin	SA-0056	Poaceae	Wakha	Herb	i. Used as Fodder	40	0.13	0.15	100
<i>Cynodon dactylon</i> (L.) Pers.	SA-0065	Poaceae	Kabal	Herb	i. Shoot infusion used as blood purifier ii. Ornamental grown in home lawns	95	0.32	0.35	85
<i>Dactylis glomerata</i> L	SA-0070	Poaceae	Wakha	Herb	i. Domestic grass grown for ground cover and for lawns	70	0.23	0.25	100
<i>Dactyloctenium aegyptium</i> (L.) P.Beauv.	SA-0072	Poaceae	Wakha	Herb	i. Used as fresh and and also dry it to store for offseason	40	0.13	0.15	100
<i>Dactyloctenium aegyptium</i> (L.) Willd.	SA-0073	Poaceae	Wakha	Herb	i. Shoot infusions used as cooling agent ii. Used as fodder	150	0.50	0.55	100
<i>Desmostachya chyabipinnata</i> (L.) Stapf.	SA-0080	Poaceae	Wakha (Drab)	Herb	i. Used as fodder	60	0.20	0.22	100
<i>Digitaria ciliaris</i> (Retz.) Koel	SA-0083	Poaceae	Wakha	Herb	i. Fodder	80	0.27	0.30	90
<i>Digitaria violascens</i> Link	SA-0085	Poaceae	Wakha	Herb	i. Shoot infusion used as laxative ii. Used as Fodder	95	0.32	0.35	85
<i>Diplachne fusca</i> (L.) P. Beauv.	SA-0088	Poaceae	Wakha	Herb	i. Used as fodder	30	0.10	0.10	100
<i>Eragrostis ciliaris</i> (L.) R.Br.	SA-0092	Poaceae	Wakha	Herb	i. Used Fodder	40	0.13	0.15	100
<i>Eragrostis pilosa</i> (L.) P. Beauv.	SA-0093	Poaceae	Wakha	Herb	i. Used Fodder	50	0.17	0.20	100
<i>Eriophorum comosum</i> (Wall ex Roxb) Nees.	SA-0095	Poaceae	Wakha	Herb	i. It is fodder of low quality.	30	0.10	0.10	100
<i>Festuca arundinacea</i> Schreb.	SA-0051	Poaceae	Wakha	Herb	i. Used as fodder	70	0.23	0.25	100
<i>Heteropogon contortus</i> (L.) P. Beauv. Ex. Roem. &Schult.	SA-00111	Poaceae	Barwaza	Herb	i. It is layered on the floors of old mosques and serves as a mat and insulting agent.	40	0.13	0.15	100
<i>Hyparrhenia hirta</i> (L.) Stapf.	SA-00112	Poaceae	Wakha	Herb	i. Fodder, used as a thatching grass and for making mats and baskets	120	0.40	0.45	90
<i>Imperata arundinacea</i> Cyrillo	SA-0079	Poaceae	Wakha	Herb	i. Shoot infusions used for dysentery and menorrhagia ii. Fodder	50	0.17	0.20	100

<i>Imperata cylindrica</i> (L.) Raeuschel.	SA-00113	Poaceae	Wakha	Herb	i. Use as fodder	150	0.50	0.55	100
<i>Lolium perenne</i> L.	SA-0071	Poaceae	Wakha	Herb	i. Used as fodder	80	0.27	0.30	90
<i>Oryza sativa</i> L.	SA-00147	Poaceae	Sholi	Herb	i. Grain edible (rice) ii. Hay is used as fodder, also used for cleaning and washing utensils.	100	0.33	0.35	85
<i>Pennisetum glaucum</i> (L.) R. Br.	SA-00150	Poaceae	Khanjari	Herb	i. Fodder, grain used as food for pigeon and parrot	150	0.50	0.55	100
<i>Phalaris minor</i> Retz.	SA-00152	Poaceae	Wakha	Herb	i. Fodder	90	0.30	0.35	85
<i>Poa alpina</i> L.	SA-00164	Poaceae	Wakha	Herb	i. Fodder for goat and sheep	40	0.13	0.15	100
<i>Poa annua</i> L.	SA-00165	Poaceae	Wakha	Herb	i. Dry and fresh fodder	50	0.17	0.20	100
<i>Poa bulbosa</i> L.	SA-00166	Poaceae	Wakha	Herb	i. Used as a fodder and a pasture grass	30	0.10	0.10	100
<i>Poa pratensis</i> L.	SA-00167	Poaceae	Wakha	Herb	i. Fodder	60	0.20	0.22	100
<i>Polypogon fugax</i> Nees ex Steud.	SA-00170	Poaceae	Wakha	Herb	i. Fodder	120	0.40	0.45	90
<i>Saccharum spontaneum</i> Linn.	SA-00198	Poaceae	Kay	Herb	i. Use in making winnowing trays, brooms and baskets. Also used for thatching roofs.	60	0.20	0.22	100
<i>Setaria verticillata</i> (L.) P. Beauv.	SA-00204	Poaceae	Wakha	Herb	i. Fodder	80	0.27	0.30	90
<i>Setaria viridis</i> (L.) P. Beauv	SA-00205	Poaceae	Wakha	Herb	i. Fodder	40	0.13	0.15	100
<i>Sorghum halpense</i> (L.) Pers.	SA-00212	Poaceae	Dadam	Herb	i. used as fodder	60	0.20	0.22	100
<i>Sorghum bicolor</i> (L.) Moench.	SA-00213	Poaceae	Bajara	Herb	i. Used as Fodder and Grain used as food for parrots and pigeons	30	0.10	0.10	100
<i>Triticum aestivum</i> Linn.	SA-00223	Poaceae	Ghanam	Herb	i. Used as Cereal crop ii. Hay stored as fodder for winter	50	0.17	0.20	100
<i>Zea mays</i> L.	SA-00232	Poaceae	Jowar	Herb	i. Cob hairs infusion used for variant and diabetes ii. Cereal crop iii. Cob cases are used for washing and cleaning utensils, Stems are used as fresh fodder. They are also burnt when dried	60	0.20	0.22	100
<i>Polygala abyssinica</i> R.Br.exFresen.	SA-00168	Polygalaceae	-	Herb	i. Fodder	90	0.30	0.35	85
<i>Polygonum barbatum</i> L.	SA-00169	Polygonaceae	Polpolak	Herb	i. Used for fish hunting	70	0.23	0.25	100

<i>Androsace rotundifolia</i> Hardw.	SA-0020	Primulaceae	Gulpana	Herb	i. Shoot infusion used for kidney and fever ii. Whole plant used as fodder and people also used it as ornamental plant	40	0.13	0.15	100
<i>Pteridium aquilinum</i> (L.) Kuhn Ladora	SA-00179	Pteridaceae	Frond	Frond	i. Young fronds used as vegetable	180	0.60	0.90	100
<i>Pteris cretica</i> L.	SA-00180	Pteridaceae	Fern	Fronds	i. Grown in gardens	70	0.23	0.25	100
<i>Pteris vittata</i> L.	SA-00181	Pteridaceae	Fern	Fronds	i. Grown in gardens	120	0.40	0.45	90
<i>Punica granatum</i> L.	SA-00182	Punicaceae	Anar	Tree	i. Fruit edible ii. used for Thatching	60	0.20	0.22	100
<i>Sageretia thea</i> (Osbeck) M.C. Johnst	SA-00199	Rhamnaceae	Momnara	Shrub	i. Used as fruit ii. Shoot used as fuel	30	0.10	0.10	100
<i>Ziziphus moritiana</i> Lam.	SA-00233	Rhamnaceae	Markhani	Tree	i. Leaves infusion used for diabetes ii. Fruit edible iii. Used to make Agriculture tools	70	0.23	0.25	100
<i>Ziziphus numularia</i> (Burm.f.) Wight & Arn.	SA-00234	Rhamnaceae	Markhani	Tree	i. Leaves infusion used for diabetes ii. Fruit edible iii. Used to make Agriculture tools	80	0.27	0.30	90
<i>Cotoneaster microphyllus</i> Wall.ex Lindley	SA-0063	Rosaceae	Mamanr	Shrub	i. Used for fencing, thatching and sheltering roof	90	0.30	0.35	85
<i>Duchesnea indica</i> (Andr.) Focke	SA-0090	Rosaceae	ZmakiTuth	Herb	i. Fruits edible ii. Used as Fodder	70	0.23	0.25	100
<i>Eriobrya japonica</i> Lindl.	SA-0094	Rosaceae	Alocat	Tree	i. Fruits edible ii. Used as fuel wood	60	0.20	0.22	100
<i>Fragaria nubicola</i> Lindl.ex Lacaita	SA-00101	Rosaceae	Zmaki Tuth	Herb	i. Fruit used to relieve constipation ii. Fruit edible iii. Used as Fodder	70	0.23	0.25	100
<i>Malus pumila</i> Mill.	SA-00129	Rosaceae	Manra	Tree	i. Edible fruit ii. Wood is hard and is used for agriculture tools and branches serves as fuel wood.	30	0.10	0.10	100
<i>Pnrus armeniaca</i> Marsh.	SA-00173	Rosaceae	Khobani	Tree	i. Bark infusions used for hepatitis ii. Edible fruit iii. Used as fresh fodder and fuel wood.	100	0.33	0.35	85
<i>Prunun samygdalus</i> Batsch.	SA-00174	Rosaceae	badam	Tree	i. Edible fruit ii. Used fuel wood and thatching	80	0.27	0.30	90

<i>Prunus cerasifera</i> Ehrh.	SA-00175	Rosaceae	Alocha	Tree	i. Edible fruit ii. Used as fuel wood and thatching	50	0.17	0.20	100
<i>Prunus cornuta</i> (Wall. Ex Royle stend)	SA-00176	Rosaceae	Badara	Tree	i. Edible fruit ii. Used for making Agricultural tools	60	0.20	0.22	100
<i>Prunus domestica</i> Linn.	SA-00177	Rosaceae	Alucha	Tree	i. Edible use cure jaundice and as refrigerant ii. Edible fruit iii. Wood is used for burning. Leaves serves as fresh fodder. It is honey bee species.	40	0.13	0.15	100
<i>Prunus persica</i> L.	SA-00178	Rosaceae	Shaltalo	Tree	i. Edible fruits ii. Fuel wood, leaves as fodder.	50	0.17	0.20	100
<i>Pyrus pashia</i> Ham ex. D. Don	SA-00185	Rosaceae	Tangai	Tree	i. Fruit effective against laxative ii. Fuel wood and honey bee specie iii. Fruit edible	40	0.13	0.15	100
<i>Pyrus</i> Spp	SA-00186	Rosaceae	Tangay	Tree	i. Used as fruit ii. Used as fuel wood	150	0.50	0.55	100
<i>Rosa Indica</i> L.	SA-00193	Rosaceae	Gulab	Shrub	i. Flower juice used for face beauty ii. Ornamental	150	0.50	0.55	100
<i>Rosa moschata</i> J. Herm.	SA-00194	Rosaceae	Gulab	Climber	i. Direct fruits eating to cure stomach disorders ii. used as Ornamental, fencing and hedges, honey bee species.	100	0.33	0.35	85
<i>Rosa webbiana</i> Wallich ex Royle	SA-00195	Rosaceae	Zangligulb	Climber	i. Used for fencing ii. Used as fruit	120	0.40	0.45	90
<i>Rubus ellipticus</i> Smith.	SA-00196	Rosaceae	Karwara	Climber	i. Root infusions used for hepatitis ii. Used as fruit iii. Fodder for goats and hedge plant.	50	0.17	0.20	100
<i>Rubus fruticosus</i> Hk. f.	SA-00197	Rosaceae	Karwara	Climber	i. Root infusions used for hepatitis ii. fodder for goat and used for fencing	40	0.13	0.15	100
<i>Sorbaria tomentosa</i> (Lindl.)	SA-00211	Rosaceae	Jejri	Tree	i. Leaves used as fodder for goats	40	0.13	0.15	100
<i>Spiraea canescens</i> D. Don	SA-00214	Rosaceae	Krachi	Tree	i. Used for making basket and leaves used as fodder for goat and sheep	50	0.17	0.20	100
<i>Galium aparine</i> L.	SA-00104	Rubiaceae	Jishkay	Shrub	i. Used as fodder	40	0.13	0.15	100
<i>Galium asperuloides</i> Ed. gen	SA-00103	Rubiaceae	-	Herb	i. Used as fodder	80	0.27	0.30	90
<i>Citrus sinensis</i> L.	SA-0057	Rutaceae	Malta	Tree	i. Fruits edible	55	0.18	0.20	100

<i>Skimmia laureola</i> (DC.) Decne	SA-003	Rutaceae	NazarPanra	Shrub	ii. Used as fuel wood i. Leaves powder with water used for fever ii. Leaves smoke used against evil eye.	90	0.30	0.30	100
<i>Populus alba</i> L.	SA-00171	Salicaceae	Spardar	Tree	i. Used as fuel wood, ornamental plant, used for making shelters, leaves used as fodder for goats and sheep	40	0.13	0.15	100
<i>Populus caspica</i> (Bornm.) Bornm	SA-00172	Salicaceae	Sperdar	Tree	i. Extracted gum used as blood purifier ii. Used as fuel, furniture and agriculture tools	30	0.10	0.10	100
<i>Salix alba</i> L.	SA-00200	Salicaceae	Wala	Tree	i. Leaves warming used to relieve pain and leaves powder used for fever. ii. The wood is used as furniture, walking sticks, fuel wood.	40	0.13	0.15	100
<i>Salix tetrasperma</i> Roxb.	SA-00201	Salicaceae	Wala	Tree	i. Fuel wood, It is used in making cricket bat and light furniture.	120	0.40	0.45	90
<i>Acer cappadocicum</i> Gleditsch	SA-007	Sapindaceae	-	Tree	i. Used as Ornamental plant	30	0.10	0.10	100
<i>Acer pentapomicum</i> J.L. Stewart ex Brandis	SA-008	Sapindaceae	-	Tree	i. Leaves used as fodder and wood is used as firewood.	80	0.27	0.40	75
<i>Dodonea viscosa</i> (L.) Jacq.	SA-0089	Sapindaceae	Ghwarasky	Shrub	i. Leaves juice used for astringent and rheumatism ii. Used as Fuel wood, for construction, also used as ornamental plant	60	0.20	0.22	100
<i>Sideroxylon mascatense</i> (A.DC.) T.D.Penn	SA-00206	Sapotaceae	Gwargawara	Tree	i. Edible fruits ii. Fuel wood	30	0.10	0.10	100
<i>Buddle jacrispa</i> Bth.	SA-0036	Scrophulariaceae		Shrub	i. Used as fuel wood	95	0.32	0.35	85
<i>Ailanthus altissima</i> (Mill) Swingle	SA-0013	Simarubaceae	Bekanra	Tree	i. Bark infusion used for anthelmintic. ii. Leaves used Fodder, stem used for construction and furniture purposes	85	0.28	0.30	90
<i>Tamarix gallica</i> L.	SA-00217	Tamaricaceae	Jao	Tree	i. Leaves infusion or powder used for hepatitis ii. Used as fuel wood	50	0.17	0.20	100
<i>Taxus wallichiana</i> L.	SA-00218	Taxaceae	Banrraya	Tree	i. Leaves infusion used for emmenagogue and antispasmodic. ii. Used as fuel wood and making furniture	60	0.20	0.22	100
<i>Daphne mucronata</i> Royle	SA-0075	Thymelaeaceae	Laignonai	Shrub	i. Used as fuel wood and as ornamental plant	80	0.27	0.30	90
<i>Wikstroemia canescens</i> Meissn.	SA-00231	Thymeliaceae	Katanr	Shrub	Making rope and basket.	40	0.13	0.15	100

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<i>Celtis australis</i> L.	SA-0049	Ulmaceae	Tagha	Tree	i. Direct eating of fruits used against colic and amenorrhea, bark decoction as anti-allergic ii. Used as fuel wood and leaves used as fodder	95	0.32	0.35	85
<i>Celtis caucasica</i> L.	SA-0050	Ulmaceae	Tagha	Tree	i. Direct eating of fruits cure Colic and amenorrhea. ii. Fruit edible iii. Used as fuel wood and leaves use as fodder	60	0.20	0.22	100
<i>Debregea siasalicifolia</i> (D. Don) Rendle	SA-0076	Urticaceae	Ajlai	Tree	i. Used as fuel wood. Branches are used in thatching ii. Fruits edible	60	0.20	0.22	100
<i>Vitis Jacquemontii</i> Parker	SA-00230	Vitaceae	Gidar Kawar	Climber	i. Fruit is effective for laxative and leaves juice for hair growth ii. Edible fruit iii. Used as fencing and fuel	80	0.27	0.30	90