

Floral diversity and ethnobotanical profile of Anwar-Mahal, District Charsadda, Khyber Pakhtunkhwa, Pakistan

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Abstract

To organize floral diversity and explore the ethnobotanical knowledge of Anwar-Mahal Village, District Charsadda, Pakistan, the plants were collected and documented. The indigenous knowledge about plant use was obtained from the local community, and selected plant species were analyzed for their nutritional profile. Plants were collected during field visits to the study area and were identified with the help of available literature. For ethnobotanical data collection, the questionnaire method was adopted, and Informants were randomly selected from different age groups. The artifact method (*ex-situ* sampling) and the inventory method (*in-situ* sampling) were used for the same. Elemental analysis of the selected species was performed at the Centralized Resource Laboratory, University of Peshawar, Pakistan, and proximate analysis was done at the Nuclear Institute for Food and Agriculture (NIFA), Peshawar, including moisture content, ash analysis, fibers, carbohydrates, and protein. The floral diversity of the area consists of 166 species distributed in 120 genera and 47 families. Four families were monocots with 9 genera and 23 (13.86%) species, and 43 families were dicots with 111 genera and 143 (86.14%) species. Poaceae was the leading family with 17 (10.24%) species, followed by Asteraceae with 16 (9.63%) species. The number of herbs was 119 (71.69%), trees 26 (15.66%), and shrubs 21 (12.65%) species. Therophyte was the dominant life form, having 84 (50.29%) species, and microphyll with 62 (36.68%) species was the leading leaf size class. Of different species recorded, 75 (34%) were medicinal, 35 (16%) fodder, 30 (14%) fuel, 20 (09%) vegetable, 17 (08%) fruit, 13 (06%) timber, 12 (05%) ornamental, 9 (04%) condiments, 7 (03%) beverages, and 3 (1.4%) poisonous. Elements like Mg, Ca, K, Na, Cu, Fe, Mn, and Zn were found to be in varying quantities in the selected plant species.

ARTICLE TYPE

Research Paper (RP)

SECTION

Plant Biology (PB)

HANDLING EDITOR

Ozyigit, I.I. (PB)

ARTICLE HISTORY

Received: 24 Jun, 2025

Accepted: 30 Jun, 2025

Online: 28 Jul, 2025

Published: 01 Jan, 2026

KEYWORDS

Ethnobotany;
Indigenous knowledge;
Macronutrients;
Micronutrients;
Nutritional analysis

Introduction

Charsadda used to be the capital of the region and was known as Pushkalawati at the time of Alexander's invasion. The Greek historians transliterated it as Peukelaus or Peukelatis and fixed it on the Swat River. Hiuen Tsiang visited Charsadda in the 7th century and labeled its distance as 27 km northeast of Peshawar. After the independence of Pakistan, Charsadda was a tehsil of District

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CITATION (APA): Hadi, F., Haroon, A., Gul, A., Zafar, S., Shafqat, N., Jabeen, N., Asma, Rahman, H. Ur. (2026). Floral diversity and ethnobotanical profile of Anwar-Mahal, District Charsadda, Khyber Pakhtunkhwa, Pakistan. *International Journal of Applied and Experimental Biology* 5(1): 113-125.

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Peshawar and was upgraded as a district in July 1988. It is located at 34° 03' to 34° 28' North latitude and 71° 28' to 71° 53' East longitude (<https://thepukhtunkhwa.blogspot.com/2013/07/charsadda-history.html>) (Fig. 1). The district is bounded by district Malakand to the North, district Mardan to the East, district Nowshera to the Southeast, district Peshawar to the Southwest, and district Mohmand to the Northwest. The district spreads over an area of 996 square km. The district has extreme weather where the summer exists from May to September, with the extremely hot month of June (temperature up to 45 °C). July to September are monsoon months, and October is a pleasant month. November to February are cold months, while spring starts in the mid of March. There are two spells of the rainy season in a year, viz., the winter rainfall and summer rainfall.

Pakistan is a botanically rich country with about 6000 identified species, mostly distributed in the mountainous northern parts of the country (Ahmad et al., 2014). During the last few decades, research on medicinal plants, ethnobotany, and pharmacognosy has increased in Pakistan (Ali and Adnan, 2028; Shah and Hussain, 2021; Sameen et al., 2025). The local knowledge regarding plant use is declining rapidly due to modernization, dependence on allopathic medicines, and the increase in the gap between the younger generation with their traditions, norms, and culture (Awan et al., 2023). This traditional ethnomedicinal knowledge will vanish soon if it is not properly recorded (Aziz et al., 2018; Rafique Khan et al., 2021; Rehman et al., 2023; Awan et al., 2023; Kayani et al., 2024).

The present study regarding the flora and medicinal plants usage will help in documenting and preserving the traditional knowledge about their use in the research area.

Materials and Methods

Study area

The present study area, Anwar-Mahal, is a part of Union Council Turangzai, District Charsadda, Pakistan, located at 34° 13' N latitude and 71° 50' E longitude, and bounded by local constituencies of District Charsadda, viz. Maira Umerzai to Northwest, Behlola to East, Khanmahi to South, Rajjar to Southwest, and Utmanzai to West.

Floral diversity

Field visits were arranged to different parts of Anwar-Mahal, district Charsadda, on a seasonal basis for the collection of available flora and significant data about the plants. The collected plants were dried, preserved, and recognized by reviewing the relevant available literature (Ali and Nasir, 1990-1991; Ali and Kaiser, 1993-2001). The samples of some plants are presented in **Plate 1**.

Ethnobotany

For ethnobotanical studies, the questionnaire method was followed following Ali and Kaiser (2009) and Ullah et al. (2022). The informants were selected randomly, and the artifact method (*ex-situ* sampling) and inventory method (*in-situ* sampling) were used for the collection of information from the local community following Stijfhoorn (1996-1997).

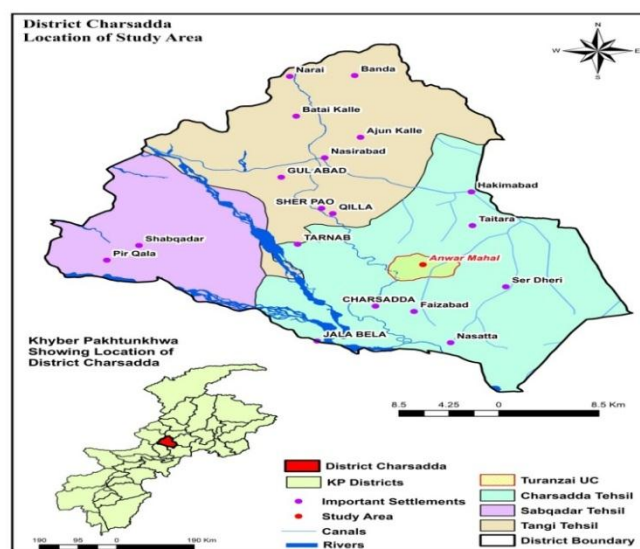
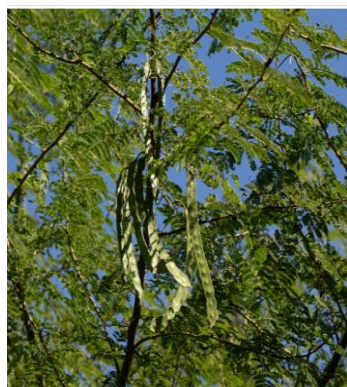


Fig. 1: A map of the study area

*Mirabilis jalapa**Amaranthus viridis**Ziziphus jujuba**Parthenium hysterophorus**Chenopodium murale**Capsella bursa-pastoris**Acacia nilotica**Cannabis sativa**Morus alba***Plate 1: Pictures of some collected plant species****Nutritional analysis**

One gram each of plant leaf material in powdered form of each of the selected plants was taken in a Pyrex flask, and 10 mL of nitric acid (HNO₃) was added to it. The material was allowed to stand overnight. Thereafter, 4 mL of perchloric acid was added to each flask, and then the material was heated on a hot plate in a fume hood. When the plant material in the flasks was completely digested, the flasks were removed, cooled down, and 100 mL of distilled water was added. The digests were filtered with a filter paper, and the filtrates were collected in labeled plastic bottles. The solutions were then analyzed through spectrometry at the Centralized Resource Laboratory, University of Peshawar, Pakistan (Dastagir et al., 2016). Proximate analysis of the selected plants was done following the procedure of the Association of Official Analytical Chemists (AOAC) at the Nuclear Institute for Food and Agriculture (NIFA), Peshawar, Pakistan, following Samreen et al. (2016).

Results and Discussion

The present study revealed that the flora of Anwar-Mahal village, District Charsadda, comprised 166 species, 120 genera, and 47 families. Of these, 4 families were monocot comprising 23 (13.86%) species, and 43 families were dicot comprising 143 (86.14%) species. Ethnobotanical data presented in **Tables 1 & 4** showed that most of the plant (75, 45.18%) species were medicinal, followed by 35 (21.08%) as fodder, 30 (18.07%) as fuel, 20 (12.05%) as vegetables, 17 (10.24%) as fruits, 13 (7.83%) for timber, 12 (7.23%) as ornamental, 9 (5.42%) as condiments, 7 (4.22%) as beverages, and 3 (1.81%) as poisonous species. Among the monocots, Poaceae was the dominant family with 17 (10.24%) species (**Table 2**), while among the dicots, Asteraceae was the leading family with 16 (9.67%) species. The most abundant life-form class was therophyte, represented by 84 (50.60%) species, followed by hemicryptophyte with 18 (10.84%) species. Nanophanerophyte and geophyte had 13 (7.83%) species each, megaphanerophyte had 12 (7.23%), chamaephyte had 9 (5.42%) species, mesophanerophyte had 6 (3.61%) species, microphanerophyte had 5 (3.01%) species, and liana had one (0.60%) species. In terms of leaf size, microphylls were the most common, with 63 (37.95%) species, followed by nanophylls with 52 (31.32%) species, mesophylls with 28 (16.87%) species, leptophylls with 20 (12.04%), microphylls with 2 (1.20%) species, and megaphylls with one (0.60%) species (**Tables 2 & 3**). Regarding habitat, herbs were the most dominant, with 120 (72.28%) species, followed by trees with 26 (15.66%) species, and shrubs with 20 (12.04%) species (**Tables 2 & 3**). These findings are analogous to what has recently been reported in the Addi Arkay district of northwestern Ethiopia (Misganaw et al., 2025). These authors have reported over 110 potential medicinal plants from this ecological niche.

Table 1: Ethnobotanical composition of the study area

Category	Number of species	Percentage (%)
Medicinal	75	45.18
Fodder	35	21.08
Fuel	30	18.07
Vegetables	20	12.05
Fruits	17	10.24
Timber	13	7.83
Ornamental	12	7.23
Condiments	09	5.42
Beverage	07	4.22
Poisonous	03	1.81

Table 2: Floral diversity and ecological characteristics of the Anwar-Mahal, district Charsadda

Families/ Plant Species	Voucher number	Life-form	Leaf size	Habit	Seasonality				Phenology (Flowering)
					Sp	Su	Au	Wi	
Angiosperms (Monocotyledons)									
Amaryllidaceae									
<i>Allium sativum</i> L.	Aneela Bot.01 (PUP)	G	N	He	-	+	+	+	Jun-Jul
<i>Allium ampeloprasum</i> L.	Aneela Bot.02 (PUP)	G	N	He	+	+	-	+	Sep-Oct
Asphodelaceae									
<i>Asphodelus aestivus</i> Brot.	Aneela Bot.03 (PUP)	G	N	He	-	+	-	-	April
<i>Asphodelus tenuifolius</i> Cav.	Aneela Bot.04 (PUP)	G	N	He	-	-	+	-	Nov-April
Cyperaceae									
<i>Cyperus rotundus</i> L.	Aneela Bot.05 (PUP)	G	N	He	-	+	-	-	April-Oct
<i>Erioscirpus comosus</i> (Wall.) Palla	Aneela Bot.06 (PUP)	H	L	He	+	-	+	-	March-April
Poaceae									
<i>Cenchrus ciliaris</i> L.	Aneela Bot.07 (PUP)	H	L	He	-	+	-	+	Feb-March
<i>Dichanthium annulatum</i> Stapf	Aneela Bot.08 (PUP)	H	N	He	-	+	+	-	March-Nov
<i>Echinochloa colona</i> (L.) Link	Aneela Bot.09 (PUP)	H	N	He	-	+	+	-	May-Sep
<i>Hordeum pusillum</i> Nutt.	Aneela Bot.10 (PUP)	Th	Mic	He	+	-	-	+	March-May
<i>Hordeum vulgare</i> L.	Aneela Bot.11 (PUP)	Th	Mic	He	+	-	-	+	Feb-April
<i>Imperata cylindrica</i> (L.) P.Beauv.	Aneela Bot.12 (PUP)	H	L	He	-	+	+	-	April-Jun
<i>Polypogon monspeliensis</i> var. <i>interruptus</i> Trin.	Aneela Bot.13 (PUP)	Th	N	He	+	+	-	-	Mar-Jul
<i>Aristida adscensionis</i> L.	Aneela Bot.14 (PUP)	H	Mic	He	-	+	-	-	March-Dec
<i>Cynodon dactylon</i> (L.) Pers.	Aneela Bot.15 (PUP)	H	N	He	+	+	-	-	All the year around
<i>Avena sativa</i> L.	Aneela Bot.16 (PUP)	Th	N	He	-	+	+	-	May-Aug
<i>Saccharum officinarum</i> L.	Aneela Bot.17 (PUP)	Ph	Mic	S	+	+	-	+	Dec-May
<i>Triticum aestivum</i> L.	Aneela Bot.18 (PUP)	Th	Mic	He	+	-	-	+	Dec-Apr
<i>Zea mays</i> L.	Aneela Bot.19 (PUP)	Th	Mes	S	-	+	-	+	Jul-Sep
<i>Digitaria abludens</i> (Roem. & Schult.) Veldkamp	Aneela Bot.20 (PUP)	Th	N	He	-	+	-	-	Jul-Aug
<i>Apluda mutica</i> L.	Aneela Bot.21 (PUP)	H	N	He	-	+	+	-	Aug-Nov
<i>Panicum antidotale</i> Retz.	Aneela Bot.22 (PUP)	H	N	He	+	+	-	-	March-Oct
<i>Saccharum spontaneum</i> L.	Aneela Bot.23 (PUP)	H	Mic	He	-	+	+	+	Jul-Sep

Angiosperms (Dicotyledons)									
Amaranthaceae									
<i>Amaranthus polygamus</i> L.	Aneela Bot.24 (PUP)	Th	N	He	+	+	-	-	All the year around
<i>Achyranthes aspera</i> var. <i>sicula</i> L.	Aneela Bot.25 (PUP)	Th	Mic	He	-	+	+	+	Flowering in 1 st year
<i>Aerva lanata</i> (L.) Juss.	Aneela Bot.26 (PUP)	Ch	Mic	He	+	-	-	+	Nov-April
<i>Spinacia oleracea</i> L.	Aneela Bot.27 (PUP)	Th	Mic	He	+	-	-	+	Feb-May
<i>Chenopodium murale</i> L.	Aneela Bot.28 (PUP)	Th	L	He	+	+	-	+	Jan-Jul
<i>Chenopodium album</i> L.	Aneela Bot.29 (PUP)	Th	Mic	He	+	+	-	+	Jan-Sep
<i>Chenopodium ambrosioides</i> L.	Aneela Bot.30 (PUP)	Th	Mic	He	+	+	+	+	Apr-Jan
Apiaceae									
<i>Coriandrum sativum</i> L.	Aneela Bot.31(PUP)	Th	N	He	-	-	+	+	March-June
<i>Daucus carota</i> L.	Aneela Bot.32 (PUP)	Th	L	He	-	+	+	-	Aug-Dec
<i>Scandix pecten-veneris</i> L.	Aneela Bot.33 (PUP)	Th	Mic	He	+	+	-	-	May-Jun
<i>Oenanthe javanica</i> DC.	Aneela Bot.34 (PUP)	G	Mes	He	-	+	+	-	Jul-Sep
<i>Torilis leptophylla</i> Rchb.f.	Aneela Bot.35 (PUP)	Th	N	He	+	-	+	-	March-May
Apocyanaceae									
<i>Calotropis procera</i> (Aiton) Dryand.	Aneela Bot.36 (PUP)	NP	Mes	S	+	+	-	-	All the year around
<i>Catharanthus roseus</i> (L.) G.Don	Aneela Bot.37 (PUP)	Th	Mic	He	-	+	+	-	Jul-Sep
<i>Nerium oleander</i> L.	Aneela Bot.38 (PUP)	NP	Mic	S	-	+	+	-	Jul-Oct
Areaceae									
<i>Nannorrhops ritchiana</i> (Griff.) Aitch.	Aneela Bot.39(PUP)	MegP	Mes	T	-	+	+	-	Jul-Nov
Asteraceae									
<i>Artemisia vulgaris</i> L.	Aneela Bot.40 (PUP)	Ch	Mic	He	-	+	+	-	Aug-Nov
<i>Cichorium intybus</i> L.	Aneela Bot.41 (PUP)	Th	N	He	-	+	+	-	May-Oct
<i>Bidens tripartita</i> L.	Aneela Bot.42 (PUP)	Th	Mic	He	-	+	+	-	Aug-Oct
<i>Cirsium arvense</i> (L.) Scop.	Aneela Bot.43 (PUP)	Th	Mic	He	+	+	-	-	Apr-Jul
<i>Echinops echinatus</i> Roxb.	Aneela Bot.44 (PUP)	Th	Mic	He	+	-	-	+	March-Apr
<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Aneela Bot.45 (PUP)	Th	Mes	He	-	+	+	-	Jun-Oct
<i>Parthenium hysterophorus</i> L.	Aneela Bot.46 (PUP)	H	N	He	+	+	-	+	Apr-Aug
<i>Sonchus arvensis</i> L.	Aneela Bot.47 (PUP)	Th	Mic	He	-	+	+	-	Jul-Sep
<i>Xanthium strumarium</i> L.	Aneela Bot.48 (PUP)	Th	Mac	He	-	-	+	-	Sep-Nov
<i>Hertia intermedia</i> (Boiss.) Kuntze	Aneela Bot.49 (PUP)	NP	Mes	He	-	+	-	-	Jul-Aug
<i>Tagetes minuta</i> L.	Aneela Bot.50 (PUP)	Th	Mic	He	-	+	-	+	Jan-Feb & Sept
<i>Helianthus annuus</i> L.	Aneela Bot.51 (PUP)	Ph	Mic	He	-	+	+	-	Jul-Oct
<i>Calendula officinalis</i> L.	Aneela Bot.52 (PUP)	Th	Mic	He	+	+	-	-	March-May
<i>Silybum marianum</i> L.	Aneela Bot.53 (PUP)	Th	Mes	He	-	+	+	-	Jul-Sep
<i>Tagetes erecta</i> L.	Aneela Bot.54 (PUP)	Th	N	He	-	+	+	-	Jul-Oct
<i>Taraxacum officinal</i> F.H.Wigg.	Aneela Bot.55 (PUP)	Th	Mic	He	-	+	+	-	May-Sep
Boraginaceae									
<i>Cordia myxa</i> L.	Aneela Bot.56 (PUP)	Ph	Mic	T	+	-	-	+	March-Apr
Brassicaceae									
<i>Brassica napus</i> L.	Aneela Bot.57 (PUP)	Th	N	S	-	+	-	-	Jul-Aug
<i>Brassica rapa</i> L.	Aneela Bot.58 (PUP)	Th	N	He	+	-	+	+	Feb-Mar
<i>Brassica oleracea</i> L.	Aneela Bot.59 (PUP)	Th	N	He	+	+	-	+	Mar-Jan
<i>Brassica nigra</i> W.D.J.Koch	Aneela Bot.60 (PUP)	Th	N	He	-	+	+	-	Jul-Aug
<i>Raphanus sativus</i> L.	Aneela Bot.61 (PUP)	Th	N	He	+	-	-	-	Mar-May
<i>Malcolmia africana</i> (L.) W.T.Aiton	Aneela Bot.62 (PUP)	Th	L	He	+	+	+	-	March-June
<i>Capsella bursa-pastoris</i> Medik.	Aneela Bot.63 (PUP)	Th	Mic	He	+	+	-	-	March-June
<i>Brassica juncea</i> (L.) Czern.	Aneela Bot.64 (PUP)	Th	L	He	+	+	-	-	March-May
<i>Sisymbrium irio</i> L.	Aneela Bot.65 (PUP)	Th	N	He	+	+	-	-	Apr-May
Caryophyllaceae									
<i>Cerastium dichotomum</i> L.	Aneela Bot.66 (PUP)	Th	N	He	+	-	+	-	March-Apr
<i>Stellaria media</i> (L.) Vill.	Aneela Bot.67 (PUP)	Ch	Mac	He	+	+	-	-	Apr-Aug
<i>Spergula arvensis</i> L.	Aneela Bot.68 (PUP)	H	L	He	+	-	+	-	Mar-Apr
Cactaceae									
<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	Aneela Bot.69 (PUP)	NP	N	S	+	+	-	-	Mar-Aug
Cannabinaceae									
<i>Cannabis sativa</i> L.	Aneela Bot.70 (PUP)	Th	Mic	He	+	+	-	-	Apr-Sep
Convolvulaceae									
<i>Convolvulus arvensis</i> L.	Aneela Bot.71 (PUP)	H	Mic	He	-	+	-	-	May-Aug
Crassulaceae									
<i>Kalanchoe pinnata</i> (Lam.) Pers.	Aneela Bot.72 (PUP)	Th	Mic	He	+	+	-	+	Feb-May
Cucurbitaceae									
<i>Citrullus colocynthis</i> (L.) Schrad.	Aneela Bot.73 (PUP)	H	Mic	He	+	-	+	+	Jan-Apr

<i>Cucurbita pepo</i> L.	Aneela Bot.74 (PUP)	Th	Mes	He	+	+	-	-	May-Sep
<i>Cucumis sativus</i> L.	Aneela Bot.75 (PUP)	Th	Mic	He	+	-	+	-	throughout year
<i>Momordica charantia</i> L.	Aneela Bot.76 (PUP)	Th	N	He	-	+	-	+	Apr-Jul
<i>Citrullus lanatus</i> (Thunb) Mats. & Nakai	Aneela Bot.77 (PUP)	Th	Mes	He	-	+	+	-	Jan-Apr
Euphorbiaceae									
<i>Euphorbia helioscopia</i> L.	Aneela Bot.78 (PUP)	Th	N	He	-	+	+	+	June-Jan
<i>Euphorbia hispida</i> Boiss.	Aneela Bot.79 (PUP)	Li	Mes	He	-	-	-	+	June-Jan
<i>Euphorbia hirta</i> L.	Aneela Bot.80 (PUP)	Th	N	He	-	+	+	+	Jul-Dec
Fabaceae									
<i>Acacia nilotica</i> (L.) Willd. ex Delile	Aneela Bot.81 (PUP)	Ph	L	T	-	+	-	-	Mar-Aug
<i>Acacia modesta</i> Wall.	Aneela Bot.82 (PUP)	Ph	L	T	+	+	+	-	Mar-May
<i>Albizia lebbek</i> (L.) Benth.	Aneela Bot.83 (PUP)	MegP	L	T	-	+	-	-	Sep-Oct
<i>Prosopis glandulosa</i> Torr.	Aneela Bot.84 (PUP)	Th	Mic	T	+	+	-	-	Mar-Sep
<i>Prosopis juliflora</i> (Sw.) DC.	Aneela Bot.85(PUP)	NP	L	T	-	+	-	-	Feb-Mar
<i>Leucaena leucocephala</i> (Lam.) de Wit	Aneela Bot.86 (PUP)	MegP	Mic	S	-	+	+	-	Jun-Nov
<i>Arachis hypogaea</i> L.	Aneela Bot.87 (PUP)	H	L	He	+	+	-	+	Jan-Aug
<i>Astragalus psilocentros</i> Fisch.	Aneela Bot.88 (PUP)	Ch	L	He	-	+	+	+	Jun-Sep
<i>Dalbergia sissoo</i> Roxb. ex DC.	Aneela Bot.89 (PUP)	MegP	N	T	+	-	+	-	Mar-May
<i>Lathyrus oleraceus</i> Lam.	Aneela Bot.90 (PUP)	Th	Mic	He	+	-	-	+	Dec-Mar
<i>Sophora mollis</i> (Royle) Graham ex Baker	Aneela Bot.91 (PUP)	MegP	N	S	-	+	+	-	May-Jul
<i>Astragalus tribuloides</i> Delile	Aneela Bot.92 (PUP)	Th	L	S	+	+	+	-	Mar-Sep
<i>Medicago minima</i> (L.) Bartal.	Aneela Bot.93 (PUP)	Th	N	He	+	+	+	-	Mar-May
<i>Medicago polymorpha</i> L.	Aneela Bot.94 (PUP)	Th	N	He	+	+	-	-	Mar-May
<i>Trifolium repens</i> L.	Aneela Bot.95 (PUP)	Th	N	He	-	+	-	-	Jul-Aug
<i>Vicia sativa</i> subsp. nigra (L.) Ehrh.	Aneela Bot.96 (PUP)	Th	N	He	-	+	+	-	Jul-Aug
<i>Trigonella foenum-graecum</i> L.	Aneela Bot.97 (PUP)	Th	Mic	He	-	+	+	+	Sep-Nov
Fumariaceae									
<i>Fumaria indica</i> (Hausskn.) Pugsley	Aneela Bot.98 (PUP)	Th	N	He	+	+	+	-	Mar-June
Iridaceae									
<i>Iris x germanica</i> L.	Aneela Bot.99 (PUP)	G	Mes	He	+	+	-	-	Apr-May
<i>Iris pallida</i> Lam.	Aneela Bot.100 (PUP)	G	Mes	He	+	-	+	-	Mar-Apr
Lamiaceae									
<i>Mentha viridis</i> L.	Aneela Bot.101 (PUP)	G	N	He	-	+	-	-	Jul-Aug
<i>Ocimum basilicum</i> L.	Aneela Bot.102 (PUP)	Ch	N	He	+	+	-	+	Throughout the year
<i>Origanum vulgare</i> L.	Aneela Bot.103 (PUP)	Ch	Mic	He	-	+	+	-	June-Oct
<i>Lamium amplexicaule</i> L.	Aneela Bot.104 (PUP)	Th	Mic	He	+	-	-	+	Dec-Apr
<i>Mentha longifolia</i> (L.) L.	Aneela Bot.105 (PUP)	G	N	He	-	+	+	-	May-Nov
<i>Mentha arvensis</i> L.	Aneela Bot.106 (PUP)	Th	Mic	He	-	+	+	-	Jul-Sep
Malvaceae									
<i>Hibiscus esculentus</i> Moench	Aneela Bot.107 (PUP)	Th	Mic	He	-	+	-	-	Apr-May
<i>Malva neglecta</i> Wallr.	Aneela Bot.108 (PUP)	Th	Mic	He	+	+	-	-	Mar-Aug
<i>Malva rotundifolia</i> L.	Aneela Bot.109 (PUP)	Th	Mes	He	+	+	-	-	March-Aug
<i>Abelmoschus esculentus</i> L.	Aneela Bot.110 (PUP)	Th	Mic	He	-	+	+	-	All the growing season
Meliaceae									
<i>Melia azedarach</i> L.	Aneela Bot.111 (PUP)	MicP	L	T	+	-	+	-	Mar-Apr
Myrtaceae									
<i>Eucalyptus camaldulensis</i> Dehnh.	Aneela Bot.112 (PUP)	MicP	N	T	+	+	-	-	May-Jan
<i>Psidium guajava</i> L.	Aneela Bot.113 (PUP)	Th	Mes	T	+	+	-	+	Mar-Apr, Aug-Sep
Moraceae									
<i>Morus nigra</i> L.	Aneela Bot.114 (PUP)	MegP	Mes	T	+	+	+	-	Mar-May
<i>Ficus carica</i> L.	Aneela Bot.115 (PUP)	MegP	Mes	T	+	-	+	+	Apr-Dec
<i>Morus alba</i> L.	Aneela Bot.116 (PUP)	MegP	Mes	T	+	+	+	-	Mar-May
Nyctaginaceae									
<i>Mirabilis jalapa</i> L.	Aneela Bot.117 (PUP)	Ch	Mes	He	-	+	+	-	Aug-Oct
<i>Bougainvillea spectabilis</i> Willd.	Aneela Bot.118 (PUP)	MesP	Mic	S	+	+	-	+	Feb-Jul
Oleaceae									
<i>Olea ferruginea</i> Wall. ex Aitch.	Aneela Bot.119 (PUP)	MesP	Mic	S	+		+	+	Nov-Mar
<i>Jasminum sambac</i> (L.) Aiton	Aneela Bot.120 (PUP)	Th	Mic	He	+	+	+	-	May-Sep
<i>Jasminum officinale</i> L.	Aneela Bot.121 (PUP)	NP	Mic	S	-	+	+	-	May-Jul
Oxalidaceae									
<i>Oxalis corniculata</i> L.	Aneela Bot.122 (PUP)	Th	N	He	-	-	+	+	Oct-Feb
Primulaceae									
<i>Anagallis arvensis</i> L.	Aneela Bot.123 (PUP)	Th	N	He	+	+	-	-	June-Aug

Portulacaceae									
<i>Portulaca oleraceae</i> L.	Aneela Bot.124 (PUP)	Th	N	He	+	-	+	-	throughout year
Plantaginaceae									
<i>Plantago major</i> subsp. Winter (Wirtg.) W.Ludw.	Aneela Bot.125 (PUP)	Th	N	He	+	+	-	-	Aug-Sep
<i>Veronica anagallis-aquatica</i> L.	Aneela Bot.126 (PUP)	Th	Mes	He	+	+	-	-	June-Aug
<i>Veronica biloba</i> L.	Aneela Bot.127 (PUP)	Th	Mic	He	+	+	+	-	Mar-Sep
Papaveraceae									
<i>Papaver somniferum</i> L.	Aneela Bot.128 (PUP)	Th	Mic	He	+	+	-	+	Apr-June
Polygonaceae									
<i>Rumex dentatus</i> L.	Aneela Bot.129 (PUP)	Th	Mic	He	+	+	+	-	May-June
Lythraceae									
<i>Punica granatum</i> L.	Aneela Bot.130 (PUP)	Th	Mic	T	-	+	+	+	Apr-Jul
Ranunculaceae									
<i>Ranunculus muricatus</i> L.	Aneela Bot.131 (PUP)	Th	Mic	He	+	+	+	-	Mar-Apr
<i>Ranunculus scleratus</i> L.	Aneela Bot.132 (PUP)	G	N	He	+	+	-	-	Mar-Apr
Rhamnaceae									
<i>Ziziphus jujuba</i> Mill.	Aneela Bot.133 (PUP)	MegP	N	T	+	+	-	+	June-Jul
<i>Ziziphus nummularia</i> (Burm. F.) Wight & Arn.	Aneela Bot.134 (PUP)	MegP	N	S	+	+	-	-	Mar-June
Rosaceae									
<i>Prunus persica</i> (L.) Batsch	Aneela Bot.135 (PUP)	MicP	Mes	T	+	+	+	-	Mar-Apr
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Aneela Bot.136 (PUP)	MegP	Mic	T	+	+	+	-	Oct-Feb
<i>Amygdalus armeniaca</i> (L.) Dumort.	Aneela Bot.137 (PUP)	MicP	Mes	T	+	+	+	-	Feb-Mar
<i>Rosa indica</i> L.	Aneela Bot.138 (PUP)	NP	Mic	S	+	+	-	-	May-Jun
<i>Prunus communis</i> L.	Aneela Bot.139 (PUP)	NP	Mic	T	+	-	+	-	Mar-Apr
<i>Prunus domestica</i> L.	Aneela Bot.140 (PUP)	NP	N	T	+	-	+	-	Feb-Apr
<i>Fragaria vesca</i> L.	Aneela Bot.141 (PUP)	H	Mic	He	-	-	+	+	Dec-Mar
Rutaceae									
<i>Citrus medica</i> L.	Aneela Bot.142 (PUP)	MegP	Mes	S	+	-	-	+	Apr-May
<i>Citrus limon</i> (L.) Osbeck	Aneela Bot.143 (PUP)	Th	N	S	+	-	-	+	Aug-Nov
Sapindaceae									
<i>Dodonaea viscosa</i> Jacq.	Aneela Bot.144 (PUP)	NP	Mic	S	+	-	-	+	Jan-Mar
Simaroubaceae									
<i>Ailanthus altissima</i> (Mill.) Swingle	Aneela Bot.145 (PUP)	MesP	Mic	T	+	+	+	-	May-June
<i>Ailanthus excelsus</i> Roxb.	Aneela Bot.146 (PUP)	MesP	Mic	T	+	+	+	-	Feb-Mar
Solanaceae									
<i>Solanum lycopersicum</i> L.	Aneela Bot.147 (PUP)	Th	Mic	He	-	+	-	-	Jul-Oct
<i>Capsicum annum</i> L.	Aneela Bot.148 (PUP)	Th	Mic	He	-	-	+	+	Apr-May
<i>Solanum nigrum</i> Acerbi ex Dunal	Aneela Bot.149 (PUP)	Th	N	He	+	+	+	-	Jul-Sep
<i>Solanum melongena</i> L.	Aneela Bot.150 (PUP)	Th	Mic	He	-	+	-	-	Throughout the year
<i>Withania coagulans</i> (Stocks) Dunal	Aneela Bot.151 (PUP)	Ch	Mic	He	+	+	-	-	Mar-Jul
<i>Withania somnifera</i> (L.) Dunal.	Aneela Bot.152 (PUP)	Ch	Mic						Throughout the year
<i>Solanum virginianum</i> L.	Aneela Bot.153 (PUP)	G	Mes	S	+	+	+	-	Jul-Sep
<i>Solanum tuberosum</i> L.	Aneela Bot.154 (PUP)	G	Mes	He	-	+	-	+	May-Aug
<i>Capsicum baccatum</i> L.	Aneela Bot.155 (PUP)	NP	Mes	He	+	+	+	-	Apr-May
<i>Solanum incanum</i> L.	Aneela Bot.156 (PUP)	NP	Mes	He					Throughout the year
<i>Datura metel</i> L.	Aneela Bot.157 (PUP)	Th	Mic	He	+	+	-	-	June-Jul
Salicaceae									
<i>Salix tetrasperma</i> Roxb.	Aneela Bot.158 (PUP)	MesP	Mes	T	+	+	-	+	Oct-March
<i>Salix acmophylla</i> Boiss.	Aneela Bot.159 (PUP)	MesP	Mic	T	+	-	-	+	Feb- Apr
<i>Populus nigra</i> L.	Aneela Bot.160 (PUP)	MicP	Mes	T	+	+	+	-	Apr-May
Tamaricaceae									
<i>Tamarix dioica</i> Roxb. ex Roth	Aneela Bot.161 (PUP)	MegP	L	S	+	+	-	+	Apr-Nov
Vitaceae									
<i>Vitis vinifera</i> L.	Aneela Bot.162 (PUP)	NP	Meg	S	+	+	+	-	May-Jul
Verbenaceae									
<i>Verbena peruviana</i> (L.) Britton	Aneela Bot.163 (PUP)	Th	N	He	-	+	+	-	Jul-Sep
Zygophyllaceae									
<i>Tribulus terrestris</i> L.	Aneela Bot.164 (PUP)	H	L	He	-	+	+	-	Throughout the year
<i>Fagonia cretica</i> L.	Aneela Bot.165 (PUP)	Th	L	He	+	+	-	+	Mar-Sep
<i>Fagonia indica</i> Burm.f.	Aneela Bot.166 (PUP)	H	L	He	-	+	-	+	Almost all year around

Life-form: Ph-Phanerophytes; G-geophytes; Th-Therophytes; H-Hemicryptophytes; Ch- Chamaephytes; Li- Lianas; NP-Nanophanerophytes; MicP-Microphanerophytes; MesP-Mesophanerophytes; MegP- Megaphanerophytes. **Leaf size:** L-Leptophylls; N-Nanophylls; Mic-Microphylls; Mes-Mesophylls; Mac- Macrophylls; Meg-Megaphylls. **Habit of plants:** T-Tree; S-Shrub; He-Herb. **Seasonality:** Sp-Spring; Su-Summer; Au-Autumn; Wi-Winter

Table 3: Percentage of leaf-form, leaf size, and habitat of the study area

No.	Group	Number of species	(%)
Leaf-form (%)			
1	Therophytes	85	50.29
2	Hemicryptophytes	19	11.24
3	Nanophanerophytes	13	7.69
4	Geophytes	13	7.69
5	Megaphanerophytes	13	7.69
6	Microphanerophytes	5	2.96
7	Chamaephytes	9	5.32
8	Mesophanerophytes	5	2.96
9	Lianas	1	0.59
Leaf size (%)			
1	Microphylls	62	36.68
2	Nanophyll	55	32.54
3	Mesophylls	28	16.56
4	Leptophylls	21	12.43
5	Macrophylls	2	1.183
6	Megaphylls	1	0.59
Plant types based on the habit			
1	Trees	26	15.38
2	Shrubs	21	12.42
3	Herbs	122	72.18
4	Leptophylls	21	12.43
5	Macrophylls	2	1.183
6	Megaphylls	1	0.59

Table 4: Ethnobotanical profile of plant resources of the study area

Family	Botanical name	Local name	Beverages	Condiments	Fuel	Fruit	Fodder	Medicinal	Ornamental	Timber	Poisonous	Vegetable
Alliaceae	<i>Allium cepa</i> L.	Piaz	-	+	-	-	-	+	-	-	-	+
	<i>Allium sativum</i> L.	Ooga	-	+	-	-	-	-	-	-	-	+
Asphodel-aceae	<i>Asphodelus tenuifolius</i> Cav.	Pyazake	-	-	-	-	+	+	-	-	-	-
Cyperaceae	<i>Cyperus rotundus</i> L.	Deela	-	-	-	-	+	+	-	-	-	-
Poaceae	<i>Dichanthium annulatum</i> (Forssk.) Stapf.	Murgha	-	-	-	-	-	+	-	-	-	-
	<i>Cynodon dactylon</i> (L.) Pers.	Kabal	-	-	+	-	+	+	+	-	-	-
	<i>Avena sativa</i> L.	Jamdary	-	-	-	-	+	+	-	-	-	-
	<i>Saccharum officinarum</i> L.	Gane	+	-	+	-	+	-	-	-	-	-
	<i>Triticum aestivum</i> L.	Ganum	-	-	-	-	+	-	-	-	-	-
	<i>Zea mays</i> L.	Makai	-	-	-	-	+	-	-	-	-	-
	<i>Apluda mutica</i> L.	Tachul	-	-	-	-	-	+	-	-	-	-
	<i>Panicum antidotale</i> Retz.	Dadam	-	-	-	-	-	+	-	-	-	-
	<i>Cenchrus ciliaris</i> L.	Mumloha	-	-	+	-	+	-	-	-	-	-
	<i>Hordeum vulgare</i> L.	Verbashy	-	-	-	-	+	+	-	-	-	-
Dicotyledons												
Amaranth-aceae	<i>Amaranthus viridis</i> L.	Gunhar	-	-	-	-	+	-	-	-	-	+
	<i>Achyranthes aspera</i> L.	Agziki	-	-	-	-	-	+	-	-	-	-
	<i>Spinacia oleracea</i> L.	Palak	-	-	-	-	-	-	-	-	-	+
Apiaceae	<i>Coriandrum sativum</i> L.	Dhanya	-	+	-	-	-	+	-	-	-	+
	<i>Scandix pecten-veneris</i> L.	Kangahay	-	-	-	-	+	+	-	-	-	-
	<i>Daucus carota</i> L.	Gajer	-	-	-	-	-	+	-	-	-	+
Apocynaceae	<i>Catharanthus roseus</i> (L.) G.Don	Sada Bahar	-	-	-	-	-	+	+	-	-	-
	<i>Nerium indicum</i> Mill.	Gandiray	-	-	+	-	-	-	+	-	-	-
Asclepiad-aceae	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Spalmai	-	-	+	-	-	+	-	-	-	-
Asteraceae	<i>Cirsium arvense</i> (L.) Scop.	Azghikai	-	-	-	-	+	+	-	-	-	-
	<i>Cichorium intybus</i> L.	Kashni	-	-	-	-	-	+	-	-	-	-
	<i>Sonchus asper</i> (L.) Hill.	Shodapay	-	-	-	-	-	+	-	-	-	-

	<i>Silybum marianum</i> L.	Lache dana	-	-	-	-	-	+	-	-	-	-
	<i>Taraxacum officinale</i> F.H. Wigg.	Ziar Gule	-	-	-	-	+	+	-	-	-	-
	<i>Artemisia vulgaris</i> L.	Tarkha	-	-	-	-	-	+	-	-	-	-
	<i>Parthenium hysterophorus</i> L.	Ganda boty	-	-	-	-	-	-	-	-	+	-
	<i>Echinops echinatus</i> Roxb.	Nare gana	-	-	+	-	-	-	-	-	-	-
	<i>Helianthus annuus</i> L.	Narparus	-	-	-	-	+	+	-	-	-	-
	<i>Xanthium strumarium</i> L.	Gheske	-	-	-	-	+	+	-	-	-	-
Boraginaceae	<i>Cordia myxa</i> L.	Lashora	-	-	+	-	-	+	-	+	-	-
	<i>Brassica campestris</i> L.	Sharsham	-	-	-	-	+	+	-	-	-	+
	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shephard, spurse	-	-	-	-	+	-	+	-	-	-
Brassicaceae	<i>Brassica rapa</i> L.	Ziar bote	-	-	-	-	+	-	-	-	-	-
	<i>Brassica nigra</i> L.	Tor sharsham	-	+	-	-	-	+	-	-	-	-
	<i>Coronopus didymus</i> L.	Kakorai	-	-	-	-	+	-	-	-	-	-
	<i>Sisymbrio irio</i> L.	Jangli sarson	-	-	-	-	-	+	-	-	-	-
	<i>Raphanus sativus</i> L.	Molay	-	-	-	-	-	+	-	-	-	+
Caryophyllaceae	<i>Stellaria media</i> (L.) Vill	Gulpullan	-	-	-	-	+	+	-	-	-	-
Cannabinaceae	<i>Cannabis sativa</i> L.	Bhung	-	-	-	-	-	+	-	-	-	-
Chenopodiaceae	<i>Chenopodium album</i> L.	Bathu	-	-	-	-	+	+	-	-	-	+
	<i>Chenopodium murale</i> L.	Sarmay	-	-	-	-	-	+	+	-	-	-
Convolvulaceae	<i>Convolvulus arvensis</i> L.	Prevatay	-	-	-	-	-	+	-	-	-	-
	<i>Citrullus vulgaris</i> Schrad.	Endwanaa	-	-	-	+	-	-	-	-	-	-
Cucurbitaceae	<i>Cucurbita pepo</i> L.	Peta Kaddu	-	-	-	-	-	+	-	-	-	+
	<i>Cucurbita sativus</i> L.	Badrung	-	-	-	-	-	-	-	-	-	+
	<i>Momordica charantia</i> L.	Karele	-	-	-	-	-	+	-	-	-	+
Euphorbiaceae	<i>Euphorbia helioscopia</i> L.	Mandaro	-	-	-	-	-	-	-	-	+	-
	<i>Melilotus indica</i> L.	Lewany	-	-	-	-	-	-	-	-	+	-
Fabaceae	<i>Trigonella foenum-graecum</i> L.	Mulkhuza	-	-	-	-	-	+	-	-	-	+
	<i>Medicago denticulata</i> Boiss.	Peshtary	-	-	-	-	+	+	-	-	-	+
Iridaceae	<i>Iris germanica</i> L.	Sur gule	-	-	-	-	-	-	+	-	-	-
	<i>Mentha longifolia</i> L.	Welany	-	-	-	-	-	+	-	-	-	-
Lamiaceae	<i>Mentha arvensis</i> L.	Podina	+	+	-	-	-	+	-	-	-	+
	<i>Origanum vulgare</i> L.	Shamaky	-	-	-	-	-	+	-	-	-	-
Malvaceae	<i>Malva neglecta</i> Wallr.	Panerak	-	-	-	-	+	+	-	-	-	+
Meliaceae	<i>Azadirachta indica</i> A.Juss.	Bikianra/Shanday	-	-	+	-	+	+	-	+	-	-
	<i>Ficus carica</i> L.	Injeer	-	-	+	+	+	+	-	+	-	-
Moraceae	<i>Morus alba</i> L.	Spin toot	-	-	-	+	-	+	-	-	-	-
	<i>Morus nigra</i> L.	Shah toot	-	-	+	+	+	-	-	+	-	-
Mimosaceae	<i>Acacia nilotica</i> (L.) Willd. ex. Delile	Kekar	-	-	+	-	-	-	-	+	-	-
	<i>Albiza lebbeck</i> (L.) Benth.	Srehk	-	-	+	-	-	+	-	+	-	-
	<i>Acacia modesta</i> Wall.	Palosa	-	-	+	-	-	+	-	+	-	-
Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh.	Lachi	-	-	+	-	-	-	-	+	-	-
	<i>Psidium guajava</i> L.	Amrood	-	-	-	+	-	+	-	-	-	-
Nyctaginaceae	<i>Mirabilis jalapa</i> L.	Gul basy	-	-	-	-	-	-	+	-	-	-
	<i>Bougainvillea spectabilis</i> L.	Chamba	-	-	+	-	-	-	+	-	-	-
	<i>Jasminum sambac</i> L.	chambaili	-	-	-	-	-	-	+	-	-	-
Oleaceae	<i>Olea ferruginea</i> Wall. ex Aitch.	Khona	-	-	-	-	+	+	-	+	-	-
	<i>Jasminum officinale</i> L.	Gata chamba	-	-	+	-	-	-	+	-	-	-
Oxalidaceae	<i>Oxalis corniculata</i> L.	Treewake	-	-	-	-	+	+	-	-	-	+
Papilionaceae	<i>Dalbergia sissoo</i> Roxb. ex DC.	Shawa	-	-	+	-	-	+	-	+	-	-
Papaveraceae	<i>Papaver somniferum</i> L.	Opium Poppy	-	-	-	-	-	+	-	-	-	-
Plantaginaceae	<i>Plantago major</i> L.	Ghawa jabay	-	-	-	-	-	+	-	-	-	-
Polygonaceae	<i>Rumex dentatus</i> L.	Shalkhay	-	-	-	-	+	+	-	-	-	+
Portulacaceae	<i>Portulaca oleracea</i> L.	Warhary	-	-	-	-	+	+	-	-	-	-
Punicaceae	<i>Punica granatum</i> L.	Anar	+	+	+	+	-	+	-	-	-	-
Ranunculaceae	<i>Ranunculus muricatus</i> L.	Zerri gul	-	-	-	-	-	+	-	-	-	-
	<i>Ziziphus jujuba</i> Mill.	Markharen	-	-	+	+	-	+	-	-	-	-
Rhamnaceae	<i>Zizyphus nummularia</i> (Burm. f.) Wight & Arn.	Karkana	-	-	-	+	+	+	-	-	-	-

Rosaceae	<i>Prunus persica</i> (L.) Batsch	Shaftalo	-	-	+	+	-	+	-	-	-	-
	<i>Fragaria vesca</i> L.	Strawbery	-	-	+	+	+	+	-	-	-	-
	<i>Rosa indica</i> L.	Gulab	-	-	-	-	-	+	-	-	-	-
	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Lokat	-	-	+	+	-	+	-	-	-	-
	<i>Prunus armeniaca</i> L.	Khormary	+	-	+	+	-	+	-	-	-	-
	<i>Prunus domestica</i> L.	Alochy	-	+	-	+	-	+	-	-	-	-
	<i>Pyrus communis</i> L.	Nashpathi	-	-	-	+	-	+	-	-	-	-
Rutaceae	<i>Citrus medica</i> L.	Narang	+	+	-	+	-	+	-	-	-	-
	<i>Citrus limon</i> L.	Neemo	+	-	+	-	-	+	+	-	-	-
Sapindaceae	<i>Dodonaea viscosa</i> Jacq.	Ghuraskay	-	-	-	-	-	-	-	-	-	-
Simaroubaceae	<i>Ailanthus altissima</i> (Mill.) Swingle	Angrezae shandae	-	-	+	-	+	+	-	+	-	-
Solanaceae	<i>Capsicum annuum</i> L.	Sur marchaky	-	+	-	-	-	+	-	-	-	-
	<i>Datura alba</i> L.	Daltura	-	-	+	-	+	+	-	-	-	-
	<i>Solanum nigrum</i> L.	Kachmachu	-	-	-	-	-	+	-	-	-	+
	<i>Solanum surattense</i> Burm.f.	Mara-ghonay	-	-	-	-	+	+	-	-	-	-
	<i>Withania somnifera</i> (L.) Dunal	Shapyanga	-	-	-	+	-	+	-	-	-	-
Saliaceae	<i>Populus nigra</i> L.	Sufaidar	-	-	+	-	-	-	-	+	-	-
Tamaricaceae	<i>Tamarix dioca</i> Roxb	Ghaz	-	-	+	-	-	+	-	+	-	-
Vitaceae	<i>Vitis vinifera</i> L.	Angoor	+	-	+	+	-	+	-	-	-	-
Zygophyllaceae	<i>Tribulus terrestris</i> L.	Azghakay	-	-	+	-	-	+	-	-	-	-
Total (103 Plants)			7	9	30	17	35	75	12	13	3	20

Elemental nutrient analysis of some selected flora

In the present study, the leaves of some selected flora of the area were analyzed for essential macro- and micro-nutrients as given below:

Macronutrients

The levels of different macronutrients presented in Table 5 showed that Mg was the highest in *Psidium guajava* leaves (19.17 mg/kg) and the lowest in *Vitis vinifera* leaves (0.13 mg/kg). Calcium (Ca) was the highest in *Mentha longifolia* (2.29 mg/kg) and the lowest in *Mirabilis jalapa* (0.82 mg/kg). Moreover,

Table 5: Elemental analysis (Macronutrients) of selected flora of the study area

Plant name	Macronutrients (mg/kg d.wt)							
	Mg		Ca		K		Na	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Mirabilis jalapa</i>	1.488	0.023	0.828	0.013	1.819	0.028	2.135	0.033
<i>Psidium guajava</i>	19.17	0.302	2.147	0.033	14.89	0.228	1.460	0.022
<i>Ziziphus jujube</i>	3.053	0.047	2.183	0.033	1.038	0.016	1.520	0.023
<i>Vitis vinifera</i>	0.130	0.002	0.939	0.014	1.400	0.021	0.439	0.007
<i>Mentha longifolia</i>	0.369	0.006	2.292	0.035	2.900	0.045	1.880	0.029

Key: Std Dev (Standard Deviation).

potassium (K) was the highest in *Psidium guajava* (14.89 mg/kg) and the lowest in *Ziziphus jujuba* (1.03 mg/kg). Sodium (Na) was the highest in *Mirabilis jalapa* (2.13 mg/kg) and the lowest in *Vitis vinifera* (0.43 mg/kg) (Table 5).

Micronutrients

The results showed that Cu was the highest in *Mentha longifolia* (5.56 mg/kg) and the lowest in *Mirabilis jalapa* (0.006 mg/kg). Iron (Fe) was the highest in *Ziziphus jujuba* (5.35 mg/kg) and the lowest in *Psidium guajava* (0.31 mg/kg) (Table 6). Manganese (Mn) was the highest in *Psidium guajava* (4.31 mg/kg) and the lowest in *Ziziphus jujuba* (0.04 mg/kg), and Zn was the highest in *Vitis vinifera* (0.97 mg/L) and the lowest in *Psidium guajava* (0.03 mg/kg) (Table 6).

Table 6: Elemental analysis (Micronutrients) of selected flora of the study area.

Plant name	Micronutrients (mg/kg d.wt)							
	Cu		Fe		Mn		Zn	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Mirabilis jalapa</i>	0.006	0.000	0.698	0.011	0.192	0.003	0.099	0.002
<i>Psidium guajava</i>	3.678	0.056	0.319	0.005	4.316	0.066	0.033	0.001
<i>Ziziphus jujuba</i>	0.018	0.000	5.352	0.082	0.048	0.001	0.249	0.004
<i>Vitis vinifera</i>	2.851	0.044	1.651	0.025	0.814	0.012	0.977	0.015
<i>Mentha longifolia</i>	5.544	0.085	3.736	0.057	3.591	0.055	0.887	0.014

Proximate composition of some selected flora

Mirabilis jalapa had the highest ash content (19.23%), followed by *Mentha longifolia* (12.25%), *Ziziphus jujuba* (6.97%), *Psidium guajava* (6.67%), and *Vitis vinifera* (6.57%) (Table 7). *Mirabilis jalapa* had the highest moisture content (5.10%), followed by *M. longifolia* (5.08%), *V. vinifera* (3.26%), *P. guajava* (2.98%), and *Z. jujuba* (2.41%) (Table 7). *Ziziphus jujuba* had the highest crude fiber (18.33%) followed by *P. guajava* (13.52%), *V. vinifera* (12.49%), *M. longifolia* (8.74%), and *M. jalapa* (4.59%) (Table 7). *Psidium guajava* had the highest crude protein (11.93%), followed by *M. jalapa* (10.44%), *Z. jujuba* (8.15%), *V. vinifera* (3.73%), and *M. longifolia* being the lowest (2.53%) (Table 7). *Ziziphus jujuba* had the highest fat content (6.18%), followed by *P. guajava* (5.26%), *M. jalapa* (4.72%), *V. vinifera* (4.47%), and *M. longifolia* (3.64%) (Table 7). *Vitis vinifera* had the highest carbohydrate content (69.45%), followed by *M. longifolia* (67.74%), *P. guajava* (59.59%), *Z. jujuba* (57.93%), and *M. jalapa* (55.89%) (Table 7).

Table 7: Proximate chemical composition (All values in percentage) of selected plants from the study area

Plant name	Protein content	Carbohydrates	Crude fiber	Fat content	Moisture content	Ash content
<i>Mirabilis jalapa</i> L.	10.45	55.89	4.60	4.72	5.11	19.23
<i>Psidium guajava</i> L.	11.94	59.59	13.53	5.27	2.98	2.55
<i>Ziziphus jujuba</i> Mill.	8.15	57.94	18.34	6.19	2.41	6.97
<i>Vitis vinifera</i> L.	3.74	69.45	12.50	4.48	3.27	6.57
<i>Mentha longifolia</i> L.	2.54	67.74	8.75	3.64	5.08	12.26

It is a fact that local knowledge about the utilization of plants is transmitted verbally mostly from generation to generation, and it is in danger as the transmission between older and younger generations is not always maintained in this regard (Yaseen et al., 2015; Hussain et al., 2023; Hussain et al., 2024). Out of 75 medicinal plants, the most common species were *Allium cepa*, *Asphodelus tenuifolius*, *Coriandrum sativum*, *Catharanthus roseus*, *Cichorium intybus*, *Cordia myxa*, *Mirabilis jalapa*, *Raphanus sativus*, *Chenopodium album*, *Cannabis sativa*, *Trigonella foenum-graecum*, *Origanum vulgare*, *Mentha longifolia*, *Mentha arvensis*, *Malva neglecta*, *Acacia modesta*, *Psidium guajava*, *Oxalis corriculata*, *Plantago major*, *Papaver somniferum*, *Punica granatum*, *Dodonaea viscosa*, *Capsicum annum*, *Tamarix dioca*, *Vitis vinifera*, and *Tribulus terrestris*. All these species have multiple uses by the local inhabitants. Thus, preservation and maintenance of this specific plant biodiversity should be done regularly. However, *in situ* and *ex situ* conservation approaches need to be implemented to counter the threats from factors such as overgrazing, vast agricultural expansion, fuel use, etc. (Misganaw et al., 2025). As an effective approach, community-based conservation seems to be indispensable to safeguarding the rich plant biodiversity of the study site.

Conclusion

The present study provides baseline information and data on the medicinal plants and their utilization in the area, and it will also help in better management, sustainability, commercialization, and improvement of livelihood security in the area. The area has an abundance of medicinal plants to treat a wide spectrum of human ailments. The unsustainable use and overexploitation of certain plants may lead to their extinction in the area, as habitat loss and soil erosion further put heavy pressure on the local vegetation. The elemental analysis showed an appreciable amount of mineral content in some selected plants of the study area. This indicates that the plants could be a source of minerals in a balanced diet as well as drugs in the pharmaceutical industry. Proximate composition concludes that all five tested plant species have adequate levels of various nutrients required for medicinal purposes.

Author(s), Editor(s) and Publisher's declarations

Acknowledgement

None declared.

Source of funding

None declared.

Contribution of authors

Planning and conducting the study: AH, FH, SZ, AG. Data collection, visualization, and interpretation: FH, AH, AG. Graphical presentation/visualization: AH, SZ, FH. Statistical analysis: AH, FH. Preparation of initial draft: AH, FH, AG, NS, SZ, HR, NJ, AS, HuR. Review of initial draft: AH, FH, AG. Proofreading and approval of the final version: AH, FH, AG, NJ, SZ, NS. Revisions and corrections: All authors.

Permissions and ethical compliance

This study does not involve human/animal subjects, and thus no ethical approval is required.

Handling of bio-hazardous materials

The authors certify that all experimental materials were handled with great care during collection and experimental procedures. After completion of the study, all materials were properly discarded to minimize/eliminate any types of bio-contamination(s).

Supplementary material

No supplementary material is included with this manuscript.

Conflict of interest

The authors declare no conflict of interest.

Availability of primary data and materials

As per editorial policy, experimental materials, primary data, or software codes are not submitted to the publisher/Journal management. These are available with the corresponding author (s) and/or with other author(s) as declared by the corresponding author (s) of this manuscript.

Authors' consent

All authors have critically read this manuscript and agreed to publish in IJAaEB.

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It is declared that the authors did not use any AI tools or AI-assisted services in the preparation, analysis, or creation of this manuscript submitted for publication in the International Journal of Applied and Experimental Biology (IJAaEB).

References

Ahmad, M., Sultana, S., Fazl-i-Hadi, S., Hadda, T.B., Rashid, S. et al. (2014). An ethnobotanical study of medicinal plants in high mountainous region of Chail valley (District Swat - Pakistan). *Journal of Ethnobiology and Ethnomedicine* 10:36. <https://doi.org/10.1186/1746-4269-10-36>.

- Ali, H., Qaiser, M. (2009). The ethnobotany of Chitral valley, Pakistan with particular reference to medicinal plants. *Pakistan Journal of Botany* 41(4):2009-2041.
- Ali, R., Adnan, M. (2018). Nutritional potential of Pakistani medicinal plants and their contribution to human health in times of climate change and food insecurity. *Pakistan Journal of Botany* 50(1):287-300.
- Ali, S.I., Nasir, Y.J. Eds. (1990-1991). "Flora of Pakistan", Islamabad, Karachi.
- Ali, S.I., Qaiser, M. Eds. (1993-2001). "Flora of Pakistan", Islamabad, Karachi.
- Awan, M.S., Dar, M.E., Hussain, K., Sabir, S., Iqbal, T. et al. (2023). Ethnomedicinal utilization and conservation status of highland flora from Western Himalayas of Azad Jammu and Kashmir, Pakistan. *Ethnobotany Research and Applications* 26:1-20.
- Aziz, M.A., Khan, A.H., Ullah, H., Adnan, M., Hashem, A. et al. (2018). Traditional phytomedicines for gynecological problems used by tribal communities of Mohmand Agency near the Pak-Afghan border area. *Revista Brasileira de Farmacognosia* 28(4):503-511.
- Dastagir, G., Ahmed, R., Shereen, S. (2016). Elemental, nutritional, phytochemical, and biological evaluation of *Hypericum perforatum* L. *Pakistan Journal of Pharmaceutical Sciences* 29(2):203-221.
- Hussain, K., Dar, M.E., Mehmood, A., Sabir, S., Awan, M.S. et al. (2023). Ethnomedicinal uses and conservation status of medicinal orchids from Western Himalayas of Azad Jammu & Kashmir, Pakistan. *Ethnobotany Research and Applications* 26:1-13.
- Hussain, M., Alam, J., Shah, G.M., Gul, A., Majid, A. et al. (2024). Assessment of traditional knowledge of medicinal plants practiced by rural communities residing around Musk Deer National Park, Kashmir Himalaya, Pakistan. *Ethnobotany Research and Applications* 28:1-23.
- Kayani, S., Ahmad, M., Gillani, S.W., Manzoor, M., Rehman, F.U. et al. (2024). Ethnomedicinal appraisal of the medicinal flora among the sub-alpine and alpine indigenous communities of Palas Valley Kohistan, Northern Pakistan. *Ethnobotany Research and Applications* 28:1-29.
- Misganaw, W., Masresha, G., Alemu, A., Lulekal, E. (2025). Ethnobotanical study of medicinal plants used to treat human and livestock ailments in Addi Arkay district, northwest Ethiopia. *Journal Ethnobiology Ethnomedicine* 21:31. <https://doi.org/10.1186/s13002-025-00775-3>
- Rafique Khan, S.M., Akhter, T., Hussain, M. (2021). Ethno-veterinary practice for the treatment of animal diseases in Neelum Valley, Kashmir Himalaya, Pakistan. *PLoS ONE* 16(4):e025011. <https://doi.org/10.1371/journal.pone.0250114>.
- Rehman, S., Iqbal, Z., Qureshi, R., Shah, G.M., Irfan, M. (2023). Ethnomedicinal plants uses for the treatment of respiratory disorders in tribal District North Waziristan, Khyber Pakhtunkhwa, Pakistan. *Ethnobotany Research and Applications* 25:1-16.
- Sameen, A., Sadia, H., Sultana, T., Khan, K., Malik, K. et al. (2025). Ethnobotanical study of medicinal plants used for treatment of Diabetes in Southern Punjab, Pakistan. *Ethnobotany Research and Applications* 30:1-10.
- Samreen, U., Ibrar, M., Badshah, L., Ullah, B. (2016). Nutritional and elemental analysis of some selected fodder plants of Darazinda FR D.I. Khan, Pakistan. *Advances in Plants & Agriculture Research* 4 (1):127-141.
- Shah, S.M., Hussain, F. (2021). Weed diversity in maize fields of Mastuj valley, Hindukush range, Pakistan. *Pure and Applied Biology* 5(4):1044-1050.
- Stijhoorn, E. (1996-97). New timber forest products and Ethnobotany, concepts for management and research. Department of Environment and Plant Biology, Ohio University, author, Ohio/ LATIE, Turrialba, 32.
- Ullah, K., Badshah, L., Ahmad, S., Faisal, Khan, F. et al. (2022). Floristic inventory and ecological evaluation of Siar dara, district Dir (lower), Khyber Pakhtunkhwa, Pakistan. *Bioscience Research* 19(1):487-491.
- Yaseen, G., Ahmad, M., Sultana, S., Alharrasi, A.S., Hussain, J. et al. (2015). Ethnobotany of medicinal plants in the Thar Desert (Sindh) of Pakistan. *Journal of Ethnopharmacology* 163:43-59.