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Ethno-Medicinal and Phytosociological investigation of Hero Shah and its adjoining areas in Dargai, Pakistan

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Ethnobotanical is the study that shows how people of the specific area used plants for various purposes. The study was conducted during August 2023 to December 2023. The aim of the present study was to investigate and document the Ethnobotanical uses of plants in Hero shah Tehsil Dargai, Pakistan by local people of the area. The Ethnobotanical information was collected through field trips, observations and semi structured questionnaires. A total of 100 Ethnobotanical plants belonging to 45 families were collected from the study area. The study showed that the local people use these plants to cure diseases such as diarrhea, dysentery, malaria, asthma, cough, fever, diabetes, pneumonia, anemia, sore throats and ulcer. The details such as Botanical name, local name, family name, habit, habitat, part used, and Ethno-medicinal uses were recorded for such species. The collected Phytosociology plants total of 27 plants including 27 genera and 19 families were reported in this study. Phytosociological study showed that there are 27 total plants in Hero Shah. The plant family Fabaceae was the most dominant family followed by Poaceae. The study showed that the study area is rich in medicinal plants and the local people used these plants for the treatment of various ailments.

Keywords: Hero Shah, Medicinal plants, ethnobotany, phytosociology.

INTRODUCTION

Introduction to the study area:

Hero shah Tehsil Dargai, District Malakand, situated in the Malakand Division of Khyber Pakhtunkhwa, Pakistan, is positioned at approximately 34° 35´ N latitude and 71° 57´ E longitude. The district spans from the rugged and solid mountain ranges of the Hindukush, descending towards the northern part of the Peshawar valley. In general, Malakand serves as a connecting route to Swat, Chitral, and Dir districts (Zeb et al. 2022).

Hero Shah Tehsil Dargai, District Malakand is situated in the northern region of Khyber Pakhtunkhwa, Pakistan, with coordinates 34° 25' 31.0" N and 71° 49' 09.8" E. Spanning an area of 952 km2, it has a population of 720,295 as of 2018. The climate in this area exhibits hot and clear summers (May-September) and cold, partly cloudy winters (December-March). Throughout the year, the average temperature ranges from 3.8 to 44°C, although extreme temperatures as low as 1°C or as high as 48°C have been recorded (Begum et al. 2022).

The Hero Shah Tehsil Dargai region is located in the northern part of Khyber Pakhtunkhwa province and spans an area of 452 square kilometers, positioned between the coordinates 34°35'N and 71°72'E. This area is characterized by a semi-arid climate and is surrounded by natural features such as the foothills of Dir and Swat to the North, Mohmand and Bajor Agency to the Northwest, Charsadda and Mardan to the South, and district Buner to the East. The primary source of groundwater recharge in this region is through precipitation and snowfall (Rashid et al. 2020).

Ethnobotany

Medicinal plants have held a pivotal role in shaping human culture, serving as abundant reservoirs of traditional remedies. Many of today's modern medicines find their origins in these plants.

Figure 1: Hero Shah Tehsil Dargai, Pakistan (Google Map)

In Pakistan, a significant portion of the population (approximately 4.80%) relies on medicinal flora as an integral component of their local healthcare practices. This traditional medicinal knowledge has been a constant presence in households, passed down through generations over time.

In addition to their medicinal value, vegetables are commonly consumed as a staple food in Pakistan (Rahim et al. 2023).

These vegetables offer a wealth of essential nutrients, including proteins, fats, and carbohydrates, providing a valuable source of energy for those who consume them. Traditional fuels such as firewood, dung, and crop residues currently play a substantial role in meeting the daily energy needs of both rural and economically disadvantaged urban households in Pakistan. It's worth noting that low consumption of fruits and vegetables poses a significant risk factor for chronic diseases, although prevalence data for this issue, particularly in developing countries, are often lacking (Ahmad et al. 2023).

Phytosociology

Phytosociology is a branch of botany focused on the study of plant communities' structure, composition, development, and the interrelationships between species within these communities. The term "Phytosociology" was coined by "Jozef Paczoski" in 1896. Many scholars define phytosociology as a field within plant science that examines vegetation in its entirety, encompassing its floristic makeup, growth patterns, and geographical distribution. Phytosociology operates as a subset of plant ecology, primarily concerned with analyzing the presence of plant species within communities (Rashid *et al.* 2023). Weeds are essentially unwanted plants that thrive in cultivated and domesticated areas. They exhibit adaptability to a wide range of soil and climatic conditions and are ubiquitous, affecting virtually all crops. Plant species belonging to the families *Asteraceae*, *Brassicaceae*, *Fabaceae*, and *Poaceae* are the primary components of weed populations in cultivated fields. Worldwide, there are approximately 30,000 weed species, with more than 50 of them posing significant threats to agricultural crops. Weeds are formidable competitors and pose hidden challenges to crops due to their robust growth, competing vigorously with cultivated plants for essential resources like nutrients, space, water, and sunlight, thereby reducing both crop quantity and quality (Anwar et al. 2020).

MATERIALS AND METHODS

Plants collection, preservation, identification

The plants were meticulously collected and then prepared for preservation, following the established methods as described by Forman and Bridson. This preservation process involved carefully pressing, drying, and mounting the plant specimens on herbarium sheets to ensure their longevity and usability. To accurately identify the preserved plants, an array of references was consulted, including Stewart (1982), data from, information from the Tropics project in Pakistan, and existing botanical literature. These metrics provided valuable insights into the significance and frequency of use of each plant species within the local ecosystem. Once the plants were successfully preserved and

identified, they were carefully deposited on herbarium sheets and subsequently submitted to the herbarium. This ensured that the plant specimens would be readily accessible for future research, conservation efforts, and educational purposes, contributing to the ongoing study and appreciation of the region's botanical diversity (Ijaz et al. 2018). The collected plants were identified with help of flora of Pakistan and taxonomist using various taxonomic evidences such as morphology, anatomy etc.

Field visit and Ethnobotanical information

Ethnobotanical information and plant collection were meticulously gathered during extensive field trips conducted within the research area. This invaluable data was meticulously compiled through a combination of interviews, structured questionnaires, and in-depth discussions with the local community. Our primary sources of knowledge were the local hakims (traditional healers) and esteemed elderly individuals, who generously shared their insights and wisdom. The research methodology closely followed the approach outlined by Rahim (2023), albeit with some judicious modifications to suit our specific objectives. Our paramount focus remained on obtaining highly precise and comprehensive data concerning plant habitat, distinctive characteristics, indigenous names, the various plant parts utilized, and other pertinent ethnobotanical details, all tailored to the unique context of Hero Shah Tehsil in the Dargai region of the Malakand district (Gairola et al. 2023).

Use Value (UV)

The significance of different plant types within a local area is a crucial aspect of our research, and we gauge it by considering two key factors: the frequency of a plant's use across various categories and the level of knowledge about its uses among community members. These combined values are commonly referred to as the "use value," and they shed light on the practical importance of a specific plant species within the local population (Gairola et al. 2023).A high use value for a particular plant signifies its considerable importance within the local community and the regularity with which it is put to use. To calculate the use value, we employed a formula that has been previously utilized by researchers such as Rossato et al. (1999) and Silva & Albuquerque (2004). This formula serves as a quantitative tool to help us assess and rank the significance of various plant species in our study area, contributing to a more comprehensive understanding of the local ethnobotanical landscape.

$UV=\sum U_i / n$

U=use V=value

(U_i) represent number of uses disclosed by an informant for each type.

(n) Represent the total amount of informants who participated in study.

Relative Importance (RI)

In our study, the evaluation of the significance of various species within the local community was a crucial aspect of our research. To accomplish this, we employed the relative importance techniques developed by Prance and Bennet (2000). This method allowed us to precisely measure the number of categories and uses associated with each individual plant species. By applying the established formula for calculating relative importance, we were able to systematically assess the relative significance of these plant species within the community. This approach provided us with valuable insights into the multifaceted roles that these plants played in the lives of the local residents, shedding light on their cultural, medicinal, and practical importance.

RI=NUC+NT

RI=Relative Importance

NUC=number of use category

The relative importance of a particular species is ascertained by calculating a ratio, which involves the number of categories in which that species is utilized divided by the total number of use categories assigned to it. This resulting ratio is then divided by the number of use categories associated with the most versatile or multipurpose species, often referred to as NUCVS (number of use categories of the most versatile species).This method allows us to gauge the relative importance of each species within the context of its various uses. By normalizing this ratio against the most versatile species, we obtain a clear and standardized measure of the significance of each plant species in terms of its multi functionality and utility within the community.

NT= Number of types.

It represents the ratio of the total of different uses assigned to each species to the total number of use types (NTS), divided by the total number of use types recognized to the most significant taxon (NTMIT).

MIT=Most Importance Taxon

This index is totally independent of the number of citation and the number of informants that cite the varieties.

Phytosociology

A comprehensive survey of the research area was conducted to identify various communities based on their vegetation structure, abiotic factors (such as sunlight, soil, and water), and human activities. The general characteristics of the area were recorded, and it was divided into multiple localities. Plant specimens were collected, with quadrates measuring 10m in size (10m for Trees and 5m for Shrubs, and 1m for Herbs). From each locality, 10 samples of Trees and Shrubs and 10 samples of Herbs were taken. The study observed various aspects of plants, including their location, altitude, habits, habitats, life forms, leaf spectra, status, and slope aspect. Phytosociological studies were carried out at specific sites, with a focus on species composition, density, frequency, coverage, and habitats. Collected plants were

pressed, dried, and mounted on herbarium sheets. Statistical tools were used to analyze the gathered data and calculate community attributes such as Importance value, Species richness, Species diversity, and Maturity index in the research area (Ijaz et al. 2018).

RESULTS AND DISCUSSION

A Total of 100 Ethno-medicinal plants belonging to 45 families and 88 Genera. The collected Ethno-medicinal plants were arranged Botanical name wise in alphabetical order. The details description of each plant such as botanical name, local name, family name, habit, habitat, part used, Ethno-medicinal uses of our result is shown in table 1

Ethnobotanical study is a scientific branch that focuses on the relationship between plants and human societies. It encompasses various disciplines such as anthropology, literature, and plant sciences. Ethnobotany explores the traditional and direct uses of plants by people, including their roles as food sources, medicines, clothing materials, hunting resources, and in local traditions. This multidisciplinary field provides valuable insights into the ways in which plant species are utilized by specific communities in different regions (Zeb et al. 2020).

Each plant was identified with the help of flora of Pakistan. These results are in line with Iqbal et al. (2020). Who reported the similar results of quantitative analysis of ethnobotany and common remedies associated with the threatened flora of Gujranwala region, Punjab, Pakistan.

The collected Phytosociology plants total of 27 plants including 27 genera and 19 families were reported in this study. Phytosociological study showed that there are 27 total plants in Hero Shah.

The plant family Fabaceae was the most dominant family followed by Poaceae. These results are in line with kunwar et al. (2020). Who reported the similar results of vegetation structure and species diversity of the herbaceous layer in different Phytosociological habitats of Daudzai, Peshawar.

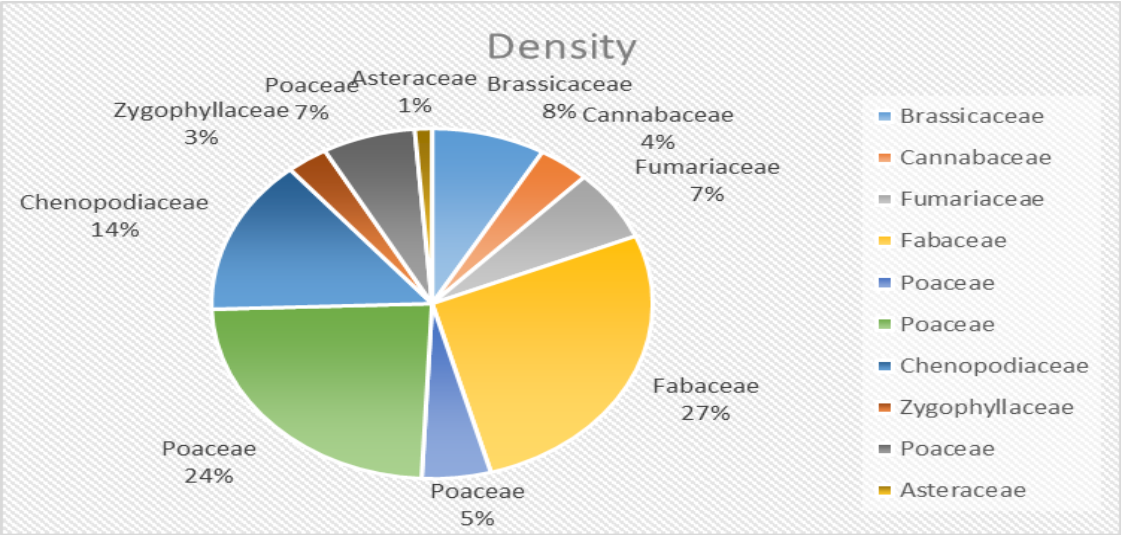

Figure 2: Phytosociology of Herbs

Table 1: Ethno-Medicinal Plants Hero Shah in Dargai, Pakistan

S. No	Botanical Name	Local name	Family Name	Part Use	Medicinal Use
1	*Ailanthus altissima* mill	Spena shandai	Simarubaceae	Dried bark, Roots	Asthma, fast heart rate
2	*Adiantum capillus* veneris	Fern	Pteridaceae	Rhizomes, and roots	Antibacterial, antifungal
3	*Araucaria heterophylla*	Chatray boti	Araucariaceae	Aerial part	Antitumor, gastro protection
4	*Amaranthus viridis* L	Chalwai	Amaranthaceae	Leaves, seeds, roots	Analgesic, antiulcer and diabetic
5	*Aspargus officinalis*	Thendoni	Asparagaceae	Root, seeds	Tuberculosis, schistosomiasis
6	*Allium sativam*	Piazoki	Amaryllidaceae	Blub	Lower blood pressure, cholesterol
7	*Aerva javanica*	Spin guli	Amarantheace	Roots	Diarrhea, chronic, chest pain
8	*Arivela viscosa*	Chelo	Cleomaceae	Leaves and seeds	Cure wounds, and ulcer
9	*Asparagus aethiopicus*	Asparagus	Asparagaceae	Leaves	Against heart problem,
10	*Alternanthera brasiliana*	Purple Heart	Amaranthaceae	Whole plant	Antiviral and anti-diarrhea agent
11	*Aloe vera*	Aloe vera	Asphodelaceae	Green part of leaf, Gel	Treat skin injuries, digestive problems
12	*Bougainvillea spectabilis* willd	Prewaty	Nycataginaceae	Flower and stem bark	Anti-hepatotoxic, Anti-inflammatory
13	*Butea monosperma*	Palai	Fabaceae	Seeds and seeds oil	Anti-diarrheal, Anti-diabetic
14	*Broussonetia papyrifera*	Toot	Moraceae	Leaf juice	Astringent, diuretic
15	*Bassia scoparia*	Kochia	Amaranthaceae	Stem and seed	Treatment of skin diseases
16	*Beaucarnea recurvata*	Ponytail palm	Asparagaceae	Leaves	Wounds, and diuretic
17	*Cestrum nocturnum*	Raat ki rani	Solanaceae	Leaves	Anti-inflammatory, pain killer
18	*Callistemon citrinus*	Bottle brush	Myrtaceae	Leaves, flower	Diarrhea, dysentery
19	*Calotropis procera*	Spalmay	Apocynaceae	Leaves	Burn injuries, and body pain
20	*Chysanthemum morifolium*	Garden mum	Asteraceae	Dried flower	Anti-inflammatory, anti-pyretic
21	*Cartaderia selloana*	Barwaz	Poaceae	Leaves	Lawn specimen
22	*Chysopogon zizanioides*	Drab	Poaceae	Roots	Diuretic, tonic
23	*Capcicum annum* L	Ghat marchakay	Solanaceae	Fruit	Used in cooking, fruit have thick
24	*Citrus limon* L	Lembo	Rutaceae	Fruit, root	Sore throats, fevers
25	*Citrus grands*	Galgal	Rutaceae	Leaf, pulp, and peel	Headache, treat skin disorders
26	*Cissus quadrangularis*	Zangali angor	Vitaceae	Roots and stem	Asthma, malaria, cancer
27	*Cynodon dactylon* L	Kabal	Poaceae	Green leaves	Use for blood pressure
28	*Cymbopogon citratus*	Lemon grass	Poaceae	Leaves	High blood pressure, and neurological problem
29	*Citrus sinnensis* L	Malta	Rutaceae	Fruit	Use in digestion, and dysentery
30	*Cucurbitaceae*	Kadu	Cucurbitaceae	Seed and fruit	Anti-cancer, Anti-microbial
31	*Catharanthus roseus*	Gulab	Apocynaceae	Root	Cancer, diabetes
32	*Cycas revoluta thunb*	Cycas	Cycadaceae	Stem, seed, leaves	Headaches, congestion
33	*Cassia fistula*	Landes	Fabaceae	Root and leaves	Healing of wounds and gastrointestinal illness
34	*Duranta erecta* L	Duranta	Verbenaceae	Leaves, flowers	Cytotoxic, anti-viral, and anti-malarial
35	*Diospyros kaki*	Toor amlook	Ebenaceae	Leaves, bark, hard wood	Internal hemorrhage, hypertension
36	*Dodhonia viscosa* L	Ghwaraski	Spinadaceae	Stem, leaf and root	Fever, malaria
37	*Dilbergia sissoo* Roxb	Shawa	Fabaceae	Roots, dried bark	Skin diseases, stomach troubles
38	*Dracaena reflexa var* angustifolia	Dragon tree	Asparagaceae	Whole plant	Diarrhea, dysentery, poisoning

39	*Datura innoxia*	Datura	Solanaceae	Leaves and seeds	Treating fever, promoting hair and skin health
40	*Dysphania ambrosioides*	Skhabotay	Amaranthaceae	Leaves and stem	Lung infections, analgesic
41	*Eriobotrya japonica*	Loquat	Rosaceae	Leaves	Diabetes and cancer
42	*Eucalyptus camaldulensis*	Lachi	Martaceae	Gum	Tonic , antiseptic
43	*Euphorbia mili*	Euphorbia	Euphorbiaceae	Stem	Cancer and hepatitis
44	*Ficus carica* L	Inzar	Moraceae	Fruit, and milky juice	Used for stomach cleaning
45	*Ficus pumila* L	Prewaty	Moraceae	Leaf, seed oil	Piles, uterine problems
46	*Hibiscus rosa* sinensis	Gulab	Malvaceae	Flowers and leaves	Fever and coughs
47	*Jasminum sambac*	Spin guli	Oleaceae	Flowers	Skin diseases, ringworm
48	*Jasminum officinale*	Prewaty	Oleaceae	Flowers, roots	Liver diseases, abdominal pain
49	*Juglans regia*	Ghawaz	Juglandaceae	Kernel, leaves	Stomach aches, diarrhea
50	*Justice adhatoda* L	Bhekkar	Acanthaceae	Leaves, roots	Use in the treatment of couch
51	*Koeberlinia spinosa*	Kerhra	Koeberliniaceae	Stem	Played a role in the diet of native people
52	*Lantana camara*	Dambar guli	Verbenaceae	Leaves and roots	Wound healing, fever treatment
53	*Ligustrum ovalifolium*	Duranta	Oleaceae	Seed, flower	Fever, insomnia
54	*Lpomoea carnea*	Gulab(glory tree)	convolulaceae	Leaves	Healing body rashes and fever
55	*Leucaena leucocephala*	Srekh	Fabaceae	Bark and root	To treat cold, fevers and flu
56	*Murraya paniculata*	Gulab (duranta)	Rutaceae	Stem, leaves	Pain, diarrhea, stomach ache
57	*Melaleuca bracteata*	River tea tree	Myrtaceae	Leaves	Anti-bacterial, and herbicidal activities
58	*Murraya paniculata*	Jasmine	Rutaceae		Abdominal pain, stomach ache
59	*Mangifera indica*	Aamm	Anacardiaceae	Bark and gum	Dysentery, anaemia, asthma
60	*Musa acuminata*	Zangali kela	Musaceae	Fruit, flowers	Fever, couch, infections
61	*Morus nigra* L	Toor toth	Moraceae	Bark, root, pulp	Coughs, diabetes
62	*Mulus domestica*	Manrha (apple)	Rosaceae	Fruit, bark, leaves	Strong antioxidant activity, and lower cholesterol
63	*Melia azedarach* L	Tora shandai	Meliaceae	Stem, and leaves	Skin disorders, burns
64	*Mentha spicata* L	Podina	Limaiceae	Leaves, flower	Stomach tonic, anti-cough
65	*Nerium olender*	Gulab	Apocynaceae	Whole plant	Asthma, malaria
66	*Oxalis corniculata*	Trewaki	Oxalidaceae	Whole plant	Anti-ulcer, anti-cancer, anti-diabetic
67	*Opuntia stricta*	Zooqam	Cactaceae	Stem, fruit	Diabetes, obesity and cancer
68	*Prunus domestica*	Alochay	Rosaceae	Dried fruit, bark	Nutritive, laxative
69	*Psidium guajava* L	Amrood	Myrtaceae	Leaves, fruit	Diabetes, pain relief
70	*Prunus persica*	Shaltalo	Rosaceae	Dried leaves	Diuretic, astringent
71	*Prunus armeniaca*	Hobani	Rosaceae	Fruit	Asthma, constipation
72	*Parthenium hysterophorus* L.	Gajar ghas	Asteraceae	Whole plant	Diarrhea, dysentery, malaria
73	*Phonix dactylifera* L.	Kajora	Arecaceae	Fruit, seed	Fever, liver cancer
74	*Pinus roxberghii* sarg	Nakhtar	Pinaceae	Wood, bark	Liver tonic, and diuretic
75	*Partulaca grandiflora*	Sun rose	Portulaceae	Leaves and stem	Hepatitis, swelling, and pain in the pharynx
76	*Persicaria maculosa*	Soor guli sag	Polygonaceae	Whole plant	Diarrhea, and various urinary disorders
77	*Perilla frutescens*	Bhangjeera	Lamiaceae	Leaves, stem, seed	Anti-bacterial, anti-microbial

78	*Phoenix roebelenii*	Date plam	Arecaceae	Leaves	Removing formaldehyde
79	*Punica granatum*	Anar	Punicaceae	Bark portion	Anti-oxidant, anti-cancer
80	*Rosa chinensis*	Gulab	Rosaceae	Leaves, fruit	Coughs, arthritis, boils
81	*Rhazya stricta*	Gandichar	Apocynaceae	Leaves	Diabetes, sore throat, infectious diseases
82	*Solanum lycopersicun*	Tamator	Solanaceae	Pulped fruit, sliced fruit	Lower blood pressure, the risk of heart disease
83	*Syzgium cumini* L.	Jaman	Myrtaceae	Fruit, seed	Bronchitis, asthma, ulcers
84	*Saccharum officinarum*	Ganay	Poaceae	Cane, root	Broken bones, cough
85	*Senegalia greggi*	Palosa	Fabaceae	Bark and leaves	Stomach, ulcer, relieve diarrhea
86	*Sarcomphalus obtusifolius*	Prewaty	Rhamnaceae		Wound healing, anti-inflammatory
87	*Tagetes minuta*	Damber guli	Asteraceae	Part above the ground	Intestinal worms, and dysentery
88	*Thuja occidentalis* L.	Ogda sarwa	Cupressaceae	Leaves, leaf oil	Enuresis, cystitis, psoriasis
89	*Thuja orientalis* L.	Cheta sarwa	Cupressaceae	Leaves, leaf oil	Bacterial skin infection and cold sores
90	*Tradescantia pallida*	Purple Heart	Commelinaceae	Leaves	Anti-bacterial, and anti-cancer activities
91	*Vachellia nilotica* L.	Kikar	Fabaceae	Bark, gum	Sore throat, cold, pneumonia
92	*Vitex agnus* castus	Vitex	Lamiaceae	Seed, fruit	Inflammation, injury
93	*Vitis vinifera L.*	Kowar	Vitaceae	Leaves, fruit	Cancer, smallpox, nausea and skin
94	*Vachellia farnesiana*	Kikar	Fabaceae	Seeds and pods	Inflammation, infection
95	*Verbesina encelioides*	Zyar guli	Asteraceae	Fresh roots	Hemorrhoids, sore gums
96	*Washingtonia robusta*	Wall palm	Arecaceace	Leaves	Infestations, and disorders of human system
97	*Withania somnifera*	Koti Lal	Solanaceae	Roots	To treat various CNS disorders, epilepsy
98	*Xanthium strumarium*	Gishki	Asteraceae	Whole plant	Headache, gastric ulcer
99	*Yucca gigantea*	Yucca	Asparagaceae	Leaves	High blood pressure, joint pain
100	*Ziziphus mauritiana*	Bera	Rhamnaceae	Roots, bark	Scabies, diuretic, nausea
101	*Zea mays*	Jewar	Poaceae	Roots, stems,	Anti-cancer, diuretic effects
102	*Ziziphus jujuba*	Markhanay	Rhamnaceae	Seed and leaves	Asthma, cough

Phytosociology

The highest density observed in first quadrate was that of *Medicago polymorpha* (10.7) followed by *Cynodon dactylon* L (9.4) and *Spinacia oleraceae* (5.7). The relative density of *Medicago polymorpha* was (27.02) which was highest, followed by *Cynodon dactylon* L (23.73) *Spinacia oleraceae* (14.39). The highest cover was that of *Paspalum dilatatum* (0.0884) followed by *Spinacia oleraceae* (0.0633) *Tribulus terrestris* (0.0571). The *Medicago polymorpha* had highest relative cover which was (25.86) followed by *Cynodon dactylon* L (22.71) and *Fumaria parviflora* (11.30).Three species i-e *Medicago polymorpha*,had, *Cynodon dactylon* L*, Fumaria parviflora* had 80% frequency, followed by *Paspalum dilatatum* had 70%. The highest relative frequency recorded was (25.86) (Table 2).

The highest density observed in first quadrate was of that of Justice adhatoda L (4.3) followed by Duranta erecta L (1.8) and Nerium olender (1.1). The relative density of Justice adhatoda L was (46.23) which was highest, followed by Duranta erecta L (19.35) Nerium olender (11.82).

The highest cover was that of Justice adhatoda L (0.39) followed by Dodhonia viscosa L (0.209) Aspargus officinalis (0.0454). The Justice adhatoda L had highest relative cover which was (35.12) followed by Dodhonia viscosa L (18.82) and Duranta erecta L (18.01).Four species i-e Justice adhatoda L had 80% frequency and Duranta erecta L had 70 % frequency, and Dodhonia viscosa L, Nerium olender had 60% frequency, followed by Aspargus officinalis, Citrus limon L and Lantana camara had 50% (Table 3).

Table 2: Phytosociology of Herbs of Hero Shah in Dargai, Pakistan

S.No	Plant Name	*Family*	Density	Frequency	Cover	Relative density	Relative frequency	Relative cover	IV
1	*Brassica campestris*	*Brassicaceae*	3.3	10	0.0366	8.33	5	3.97	17.3
2	*Cannabis sativa*	*Cannabaceae*	1.5	10	0.0333	3.78	5	3.61	12.39
3	*Fumaria parviflora*	*Fumariaceae*	2.6	40	0.104	6.56	20	11.30	37.86
4	*Medicago polymorpha*	*Fabaceae*	10.7	40	0.238	27.02	20	25.86	72.88
5	*Triticum aestivum*	*Poaceae*	2	10	0.074	5.05	5	8.04	18.09
6	*Cynodon dactylon* L	*Poaceae*	9.4	40	0.209	23.73	20	22.71	66.64
7	*Spinacia oleraceae*	*Chenopodiaceae*	5.7	10	0.0633	14.39	5	6.880	26.27
8	*Tribulus terrestris*	*Zygophyllaceae*	1.2	10	0.0571	3.03	5	6.20	14.23
9	*Paspalum dilatatum*	*Poaceae*	2.7	20	0.0884	6.81	10	9.60	26.41
10	*Silybum marianum*	*Asteraceae*	0.5	10	0.0172	3.78	5	1.869	10.649
			39.6	200	0.920				

Table 3: Phytosociology for Shrubs of Hero Shah in Dargai, Pakistan

S. No	Plant Name	Family	Density	Frequency	Cover	Relative density	Relative frequency	Relative cover	IV
1	*Aspargus officinalis*	Asparagaceae	1	10	0.0454	10.75	6.66	4.088	21.498
2	*Citrus limon* L	Rutaceae	0.3	10	0.1	3.22	6.66	9.005	18.885
3	*Dodhonia viscosa* L	Spinadaceae	0.6	20	0.209	6.45	13.33	18.82	38.6
4	*Duranta erecta* L	Verbenaceae	1.8	30	0.2	19.35	20	18.01	57.36
5	*Justice adhatoda* L	Acanthaceae	4.3	50	0.39	46.23	33.33	35.12	144.62
6	*Lantana camara*	Verbenaceae	0.2	10	0.016	2.15	6.66	1.44	10.25
7	*Nerium olender*	Apocynaceae	1.1	20	0.15	11.82	13.33	13.50	38.65
			9.3	150	1.1104				

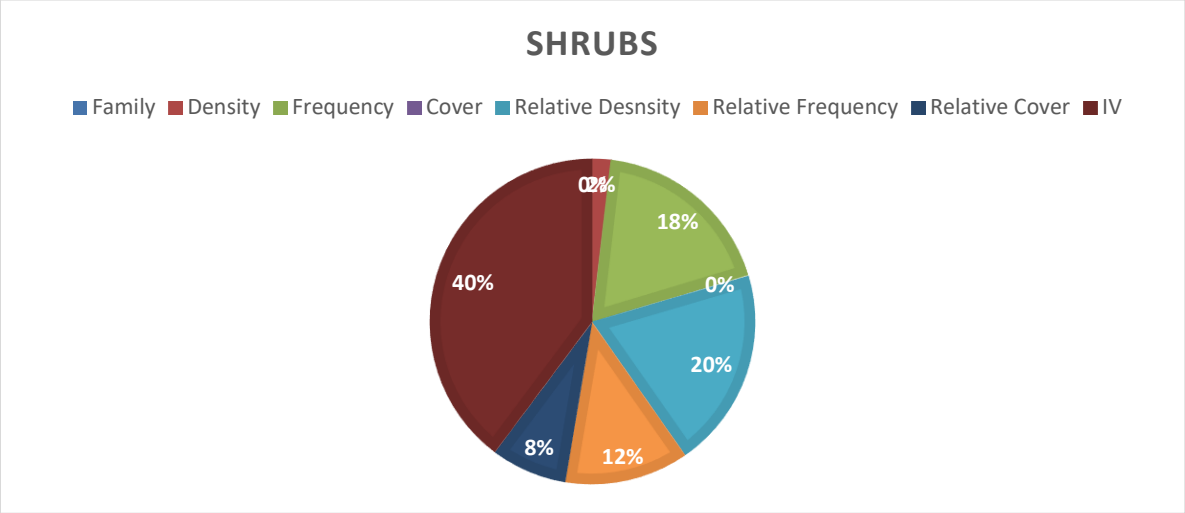

Figure 3: Phytosociology of Shrubs Hero Shah in Dargai, Pakistan

Table 4: Phytosociology for trees of Hero Shah in Dargai, Pakistan

S. No	Plant Name	Family	Density	Frequency	Cover	Relative density	Relative frequency	Relative cover	IV
1	*Ailanthus altissima* mill	Simarubaceae	0.2	10	0.05	3.57	6.25	5.097	14.917
2	*Broussonetia papyrifera*	Moraceae	0.2	10	0.04	3.57	6.25	4.077	13.897
3	*Butea monosperma*	Fabaceae	1.1	30	0.192	19.64	18.75	19.57	57.96
4	*Citrus sinnensis* L	Rutaceae	0.4	20	0.09	7.14	12.5	9.17	28.81
5	*Dilbergia sissoo* Roxb	Fabaceae	0.7	20	0.122	12.5	12.5	12.43	37.43
6	*Eucalyptus camaldulensis*	Martaceae	0.7	10	0.077	12.5	6.25	7.84	26.59
7	*Psidium guajava* L	Myrtaceae	0.5	10	0.1	8.52	6.25	10.19	24.96
8	*Senegalia greggi*	Fabaceae	0.3	10	0.05	5.35	6.25	5.097	16.697
9	*Thuja occidentalis* L.	Cupressaceae	1.1	30	0.2028	19.64	18.75	20.67	59.06
10	*Ziziphus mauritiana*	Rhamnaceae	0.4	10	0.0571	7.14	6.25	5.82	19.21
			5.6	160	0.9809	100	100		

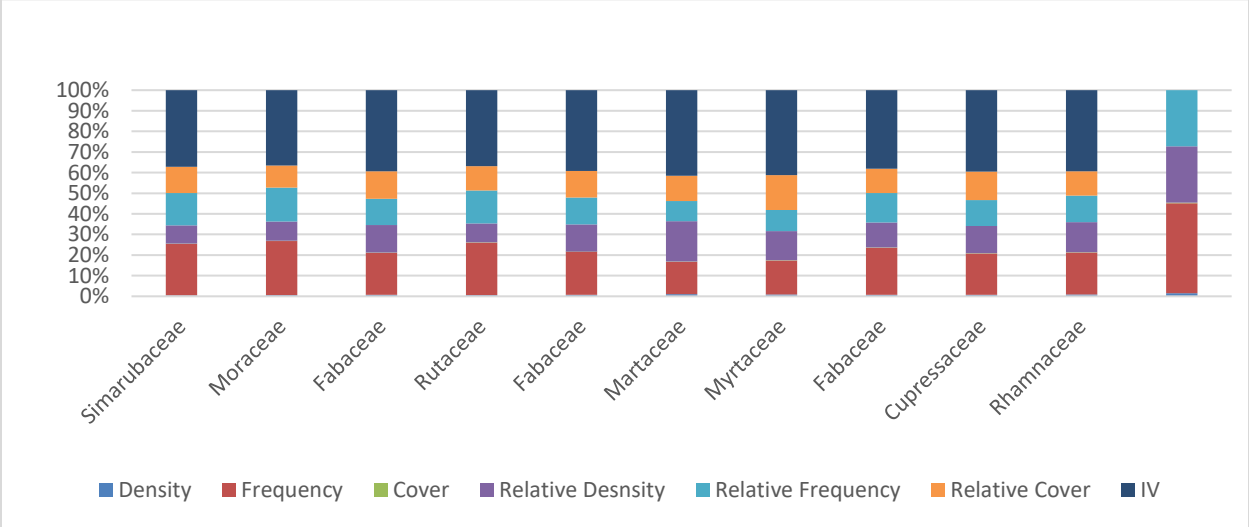

Figure 4: Phytosociology of trees Hero Shah in Dargai, Pakistan

The highest density observed in first quadrate was of that of *Butea monosperma* (1.1) followed by *Dilbergia sissoo* Roxb (0.7) and *Eucalyptus camaldulensis* (0.7). The relative density of *Butea monosperma* was (19.64) which was highest, followed by 19.64 (19.64) *Dilbergia sissoo* Roxb (12.5). The highest cover was that of *Butea monosperma* (0.192) followed by *Thuja occidentalis* L. (0.2028) *Butea monosperma* (0.192). The *Thuja occidentalis* L. had highest relative cover which was (20.67) followed by *Butea monosperma* (19.57) and *Dilbergia sissoo* Roxb (12.43). Two species i-e *Butea monosperma*, *Thuja occidentalis* L., had 80% frequency, followed by *Citrus sinnensis* L., *Dilbergia sissoo* Roxb had 70%. The highest relative frequency recorded was (18.75)

CONCLUSIONS

A total of 100 Ethnobotanical plants belonging to 45 families were collected from the study area. The study showed that the local people use these plants to cure diseases such as diarrhea, dysentery, malaria, asthma, cough, fever, diabetes, pneumonia, anemia, sore throats and ulcer. The details such as Botanical name, local name, family name, habit, habitat, part used, and Ethno-medicinal uses were recorded for such species. The study showed that the study area is rich in medicinal plants and the local people used these plants for the treatment of various ailments. The dominant flora was *Dodhonia viscosa L, Pinus roxberghii sarg, Eucalyptus camaldulensis Dehnh, Acacia nilotica L, Melia azedarach L, Delbergia Sissoo Roxb, Cycas revoluta thumb*. It was conducted that the majority of the local inhabitants in the study area are illiterate and needs to be trained about the Ethno-Medicinal plants on the scientific basis for harvesting and preservation. A number of plant species are used for various ailments in the study area. However, there is need to manage these medicinally important species on a sustainable basis. There is an urgent need for more detailed analysis of the economic value and cultural practices associated with the collected species.

Supplementary materials

The supplementary material / supporting for this article can be found online and downloaded at: https://www.isisn.org/article/

Author contributions

All authors contributed equally to the manuscript.

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Data Availability Statement

Voucher specimens are deposited at Qurtuba University of Science and information technology Peshawar, Pakistan.

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Conflict of interest

The authors declared that present study was performed in absence of any conflict of interest

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