Ethnoveterinary study of plant resources of Takht Bhai, Mardan, Khyber Pakhtunkhwa, Pakistan

Syed Awais Shah, Muhammad Adil, Hamid Ullah and Adil Muhammad

Correspondence

Syed Awais Shah, Muhammad Adil, Hamid Ullah* and Adil Muhammad

Department of Chemical and Life Sciences, Qurtuba University of Sciences and Information technology, Peshawar, Pakistan.

*Corresponding Author: hamidcpb6@gmail.com

Ethnobotany Research and Applications 28:12 (2024) - http://dx.doi.org/10.32859/era.28.12.1-13
Manuscript received: 30/01/2023 – Revised manuscript received: 02/01/2024 - Published: 02/01/2024

Databases and Inventories

Abstract

Background: This ethnoveterinary medicine study conducted in Takht Bhai investigates plant-based remedies for animal diseases, acknowledging the significant role animals play in the environment. Local residents possess substantial knowledge of medicinal plants.

Methods: Ethnoveterinary data were obtained through interviews, observations and questionnaires in 2018-2019, with a primary focus on documenting plant habits, local names, ethnoveterinary uses and the plant parts employed for treating animal diseases.

Results: A total of 79 plants from 46 different families were collected, dried, and preserved on herbarium sheets, encompassing 47 herbs, 26 trees, 4 shrubs, and 2 climbers. Various plant parts were analyzed, including leaves from 26 plants, bark from 5 plants, roots from 2 plants, oils from 2 plants, tubers from 1 plant, stems from 1 plant, and rhizomes from 2 plants. Additionally, 5 complete plants were utilized for treating various ailments. Herbs demonstrated particular efficacy in addressing severe illnesses such as hepatitis, diarrhea, mastitis, bleeding, gastrointestinal issues, mouth and foot tympany, and gas. Local residents utilized diverse plant parts, such as leaves, fruits, seeds, barks, and rhizomes, to prepare medicinal remedies.

Conclusions: The ethnoveterinary study conducted in Jalala, Mad-e-Baba, and Takkar underscores the potential of indigenous flora for promoting livestock health. This knowledge holds promise for informing sustainable healthcare solutions tailored to rural communities reliant on livestock.

Keywords: Ethnoveterinary; Medicinal plant, Rural communities; Livestock, Animal diseases.

Background

The term "ethnoveterinary" refers to the practice of treating animals using veterinary remedies derived from plants rather than synthetic drugs or medications. It is crucial to document this information, especially in Pakistan, where there is limited attention given to the use of plants for treating livestock diseases (Shah *et al*., 2012). The high cost of English medicines, coupled with issues related to environmental pollution, is contributing to the rapid disappearance of historical knowledge

about ethnoveterinary medicines. Consequently, there is an urgent need to document and validate the use of traditional methods for managing cattle health to ensure the continued availability of effective and environmentally friendly plant-based treatments (Shah *et al*., 2012).

Ethnoveterinary medicines are more accessible and sustainable in the market compared to English drugs, making them increasingly adopted by locals, particularly in rural areas where modern healthcare access is limited (Sandhu *et al*., 2012). Ethnoveterinary medicines are more accessible and sustainable in the market compared to English drugs, making them increasingly adopted by locals, particularly in rural areas where modern healthcare access is limited (Shen *et al*., 2010, Yirga *et al*., 2012, Gebrezaibiher *et al*., 2013).

The use of ethnoveterinary data extends beyond the treatment of animals and holds value in ecology, taxonomy, pharmacology, wildlife management, and other areas related to livestock medicine. These fields provide a foundation for further research and exploration. Traditional medicines, derived from plants, continue to be crucial for maintaining good health, with approximately 78 percent of people relying on traditional remedies for treating their cattle. In ethnoveterinary medicine, herbal remedies play an essential role in cattle maintenance, particularly in developing countries. Plant-based livestock drugs contribute significantly to improving cattle production by effectively managing veterinary diseases without the side effects associated with modern drugs (Yirga *et al*., 2012).

Materials and Methods

Study area

The study area encompasses three primary regions in Takht Bhai: Made-e-Baba, Jalala, and Takkar, all interconnected. Jalala spans both sides of Malakand Road, located west of Made-e-Baba, linked to Tordher Road. Made-e-Baba, in turn, is connected to Takkar through Charagh Din Kilay Road. The soil in this region is exceptionally fertile, supporting the cultivation of major crops and a variety of vegetables. Additionally, the area is conducive to the growth of various fruits, including mangoes, bananas, and pears.

Made-e-Baba, Jalala, and Takkar comprise several well-known rural areas, such as Charagh Din Kilay, Parkho, Pati Kalan, and Yakh Koi. The majority of the population in these areas belongs to Pashtoon families, with notable tribes like the Mohmand tribe, Miangan tribes, and Malik tribes. The research area is located in a subtropical region with moderate climatic conditions, experiencing four distinct seasons each year. Spring is characterized by pleasant weather and blossoming plants, while summer brings high temperatures, often reaching 40 to 45 degrees Celsius. Winter witnesses a temperature drop to around 15 degrees Celsius, resulting in cold weather. Rainfall occurs during the winter season across the research area, with an average of 12 mm in August and October, and the highest recorded rainfall reaching 122 mm (Fig. 1, Table 1).

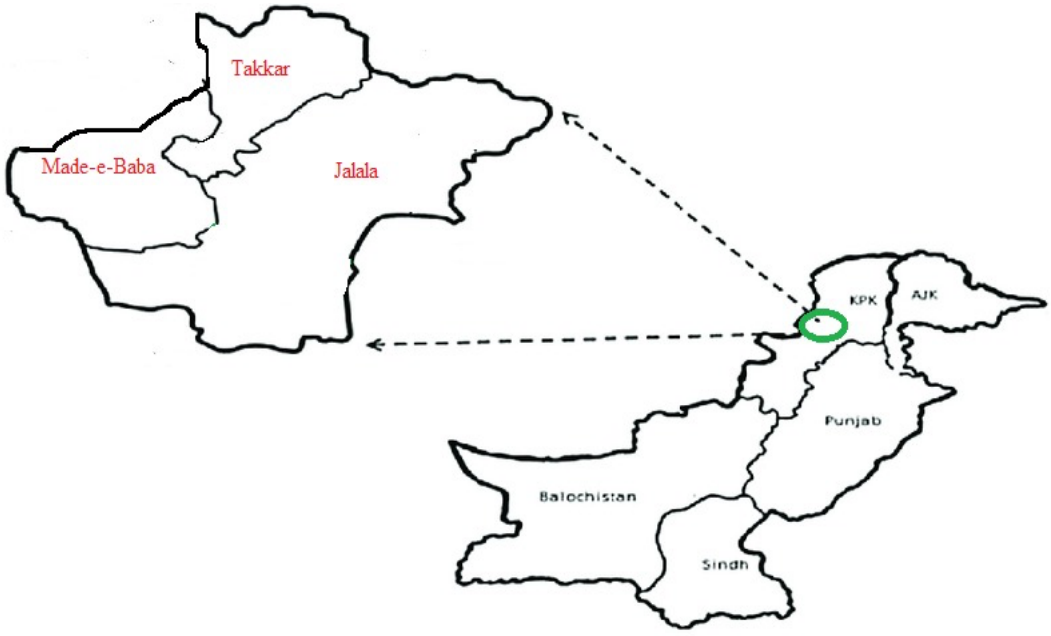

Figure 1. Map of the study area.

Table 1. Rainfall and Temperature data of the study area.

Month	January	February	March	April	May	June	July	August	September	October	November	December
Avg Max Temperature (°C)	11.7	10.72	20.47	25.34	31.19	31.19	33.14	26.32	26.32	21.44	15.6	11.7
Avg Min Temperature (°C)	3.9	2.92	4.87	14.62	19.49	25.34	23.39	21.44	19.49	15.6	6.82	5.85
Avg Precipitation (mm)	4.05	4.59	4	1.99	0.36	2.54	12.96	12.76	3.65	2.45	5.43	0.69

Data collection, Identification, and preservation of plants species

The data and information were gathered using various methods such as observation, questionnaires, and interviews with elderly individuals, farmer pan sari, ethnoveterinary doctors, agriculturists, and relevant Botany Departments. The ethnoveterinary medicinal information encompassed local and scientific names of plants, veterinary uses, and preservation status of significant plant species. A survey technique was employed to accumulate the data of medicinal plants from the residents of the research area. The plants were carefully collected, dried, preserved, and identified using the flora of Pakistan and available literature as a reference (Nasir & Ali, 1972, Shinwari *et al*., 2011). The plant specimens were submitted to the Herbarium of the Chemical and Life Sciences Department, Qurtuba University of Sciences and Information Technology Peshawar, Pakistan. A unique voucher specimen number was assigned to each medicinal species for future reference and to ensure its authenticity.

Information about the Informant and questionnaire survey

Physical observations were conducted during transit walks, and questionnaires were administered to target groups (Table 2). It is important to note that individuals from various age groups, including 40 interviewees, were interviewed, consisting of older adults, younger individuals, and females. Among the informants, the number of men was 36 and four were women. The age of the informant varied, with 20 individuals being between 40 and 60 years old, while others were above 60. Additionally, 20 participants, ranging in age from 23 to 40, provided diverse information about the utilization of plants for treating various livestock ailments.

Table 2. Details of the informants, their number and percentage.

Variable	Category	Number	Percentage
Gender	Male	36	14.4
	Female	4	1.6
Age	40 -60	20	8
	20 -40	20	8
Education	Illiterate	30	12
	Middle	5	2
		5	2
Religion	Muslims	40	16
	Non-Muslim	0	0

Data Analysis

Quantitative data analysis

"In the field of ethnoveterinary plant studies, certain statistical principles come into play. It is imperative to transform qualitative data into measurable and quantitative formats to ensure statistical validity and facilitate comparative analysis." (Hoffman *et al*., 2007, Ibrar *et al*., 2015). Various step was followed for this process.

Frequency Citation (FC)

The frequency citation represents the total amount of information that each informant is provided using different plants during the research project.

Relative Frequency Citation

The relative frequency is calculated by dividing the frequency citation by the number of informants without considering the use of groups. In the ethnoveterinary study RFC stands for the ratio of informants who revealed the use plants of FC to the total number of informants for all plants surveyed (Kayani *et al*., 2014; Ibrar *et al*., 2015; Haq *et al.,* 2022). RFC is defined by the following formula:

$$RFC = CF/N$$

RFC values range from 0 (when none of the informants cited the plants as useful) to 1 (when every informant reported the plants to be useful) (Mirzaman *et al*., 2023, Ibrar *et al*., 2015). In ethnoveterinary botanical studies, RFC indicates the local importance of plant species in a specific area.

Use Value (UV)

The Use Value (UV) is calculated by dividing the total number of uses mentioned by all informants for individual plant species (UI) by the total number of informants (N) in the survey. The formula for UV is as follows:

$$UV = \sum UV / N$$

Here, UV represents the sum of uses stated by each informant for an individual plant species. UV is the sum of all uses mentioned by all informants for that particular species. The value of UV demonstrates the relative importance of locally known plants (Ong *et al*., 2014; Ibrar *et al*., 2015; Haq *et al.,* 2023).

Pearson Correlation Coefficient

The Pearson-product moment correlation is a numerical measure of the strength of the linear association between two variables (Ibrar *et al*., 2015). It is calculated as the ratio of the covariance between the two variables to their standard deviation (Mukaka, 2012). In this context, let's assume x represents RFC (Relative Frequency Citation) and y represents UV (Use Value). The Pearson correlation coefficient, denoted as r, quantifies the relationship between these variables A value of 0 for r indicates no association between the variables, while a value greater than 0 suggests a positive association. The higher the absolute value of r, the stronger the correlation (Zhang *et al*., 2014). The square of the correlation (r^2) is a measure of the variability of cross-species in RFC that is explained by the variance in UV (Bano *et al*., 2014; Ibrar *et al*., 2015).

$$r = \frac{\sum_{i=1}^{n} (x_i - x)(y_i - y)}{\sqrt{\left[\sum_{i=1}^{n} (x_i - \bar{x})^2\right]\left[\sum_{i=1}^{n} (y_i - \bar{y})^2\right]}}$$

Results

Ethnoveterinary Data were collected from three Localities of Tehsil Takht bhai

The research project established in the year between 2018 -2019 studied three different area Made-e-Baba, Jalala, and Takkar of Takht Bhai. In this study, a total of 79 plants were reported. The distribution of these plants was as follows 47 plants (37.13%) herbs, 26 plants (20.54%) as trees, 4 plants (3.16%) shrubs and 2 plants (1.58%) were climbers (Table 5). The study found that different parts of these plants were used for various purposes in treating cattle diseases. A total of 26 plant leaves, 11 fruits varieties, 7 types of seeds, 5 bark sources, 2 root species and 2 oils, along with one each of tuber, stem and rhizome, were specifically utilized. Additionally, 15 entire plants were employed in the study (Fig. 2). These plant parts were used to address several ailments in cattle, including increasing milk production, hepatitis, diarrhea, dietary diarrhea, mastitis, bloating, gastrointestinal motility issues, mouth and foot tympany, gas, off-feeding, cold tolerance, antipyretic conditions, subnormal temperature, fever, and analgesia. Among the plants studied, 23 different species were specifically used for increasing milk production, while 56 plants were employed in treating more than one disease. The family Poaceae was the most dominant, with 12 species, followed by Fabaceae with 7 species. Local inhabitants in the area utilized various parts of these plants, such as leaves, fruits, seeds, oil, bark, and rhizomes, to prepare different products.

Quantitative Ethnoveterinary Use and Result of Pearson Correlation

The quantitative value of indices as tools for analyzing ethnoveterinary information. These indices are used to arrange and analyze data in a study. In (Table 3), the species with the highest Relative Frequency of Citation (RFC) values are *Elettaria cardamomum* (0.2), *Hordeum vulgare* (0.1), *Cyprus rotundas* (0.1), and *Citrus aurantium* (0.1). The Pearson correlation coefficient 'r' was calculated to be 0.77784, indicating a strong positive correlation. This means that the high RFC values of the x variable correlate strongly. In (Table 3), the species with the highest Use Values (UV) are *Elettaria cardamom* (0.2), *Hordeum vulgare* (0.1), *Cyprus rotundas* (0.1), and *Citrus aurantium* (0.1). These RFC and UV values serve as statistical indicators of the ethnoveterinary information provided by the local informants. The passage also suggests a linear relationship between the RFC and UV values, indicating a correlation between them. The quantitative data obtained in the study support the ethnoveterinary information gathered. The study explores various aspects of the plants, including their vegetative structure, conservation status and ethnic uses. These findings contribute to our understanding of ethnoveterinary practices.

Table 3. Ethnoveterinary uses of plants of Takht Bhai, Mardan.

Family name	Scientific Name	Local name	Habit	Voucher number	Uses	UF	FC	RFC	∑Ui	UV
Aizoaceae	*Trianthema portulacastrum* L.	Ensa**t**	H	S.Awais .13.(QUSIT)	Stomach analgesic	1	2	0.05	2	0.05
Amaranthaceae	*Amaranthus graecizans* L.	Farm ganhar	H	S.Awais.9.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Amaranthaceae	*Amaranthus viridis* L.	Ganhar	H	S.Awais.8.(QUSIT)	Increase milk	1	2	0.05	2	0.05
Amaranthaceae	*Chenopodium album* L.	Sarmy	H	S.Awais.17.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Anacardiaceae	*Mangifera indica* L.	Aam	T	S.Awais.12.(QUSIT)	Diarrhea	1	1	0.025	1	0.02
Apiaceae	*Carum carvi* L.	Zeera	H	S.Awais.10.(QUSIT)	Mouth, foot, tympney and reduce gas	3	5	0.025	14	0.25
Apocynaceae	*Calotropis procera* (Aiton) Dryand.	Spalmey	H	S.Awais.11.(QUSIT)	Constipation	1	2	0.05	2	0.05
Asteraceae	*Carthamus Oxyacantha* M.Bieb.	Ghana	H	S.Awais Bot.5.(QUSIT	Skin infection	1	3	0.075	3	0.08
Asteraceae	*Cichorium intybus* L.	Han	H	S.Awais Bot.4.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Asteraceae	*Silybum marianum* (L.) Gaertn.	Rojaky	H	S.Awais .6.(QUSIT)	Increase milk.	1	2	0.05	2	0.05
Asteraceae	*Sonchus oleraceus* L.	Shawda pai	H	S.Awais.7.(QUSIT)	Increase milk	1	2	0.05	2	0.05
Boraginaceae	*Cardia dichotoma* G. Forst.	Dela	H	S.Awais.47.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Brassicaceae	*Brassica campestris* L.	Sharsham	H	S.Awais .14.(QUSIT)	Blood in milk, increase milk	3	10	0.25	18	0.4
Brassicaceae	*Lepidium sativum* L.	Alam /Halam	H	S.Awais.15.(QUSIT)	Tympney and off feed	2	6	0.15	12	0.3
Brassicaceae	*Raphanus raphanistrum* subsp. *sativus* (L.) Domin	Mooli	H	S.Awais.16.(QUSIT)	Hepatitis	1	3	0.075	3	0.08
Cannabaceae	*Cannabis sativa* L.	Bang	H	S.Awais.21.(QUSIT)	Off feed	1	1	0.025	1	0.02
Cucurbitaceae	*Cucurbita pepo* L.	Kadoo	C	S.Awais.18.(QUSIT)	Vaginal prolapsed	1	1	0.025	1	0.02
Cucurbitaceae	*Luffa acutangula* Roxb.	Kali tori	C	S.Awais .19.(QUSIT)	Dietary diarrhea	1	2	0.05	2	0.05
Cyperaceae	*Cyperus rotundus* L.	Drab	H	S.Awais .20.(QUSIT)	Anthelminthic and anti-stomach ach	2	4	0.1	8	0.2
Dryopteridaceae	*Dryopteris juxtaposita* Christ	Baboze or Kwanjiay	H	S.Awais Bot.2.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Equisetaceae	*Equisetum arvensis* L.	Bandakay	H	S.Awais .25.(QUSIT)	Urinary bladder disorder	1	2	0.05	2	0.05

Euphorbiaceae	*Euphorbia prostrata* Aiton	Warmaga	H	S.Awais.24.(QUSIT)	Increase milk	1	1	0.025	1	0.02
Fabaceae	*Albizia lebbeck* (L.) Benth.	Sirikh	T	S.Awais Bot.3.(QUSIT)	Eye disease	1	2	0.05	2	0.05
Fabaceae	*Cassia fistula* L.	Landais	T	S.Awais.22.(QUSIT)	Colic	1	2	0.05	2	0.05
Fabaceae	*Dalbergia sissoo* Roxb. ex DC	Shawa	T	S.Awais .26.(QUSIT)	Hepatitis and constipation	2	7	0.175	15	0.38
Fabaceae	*Medicago polymorpha* L.	Peshtaray	H	S.Awais.60.(QUSIT)	Increase milk	1	1	0.025	1	0.02
Fabaceae	*Senegalia modesta* (Wall.) P.J.H. Hurter	Palosa	T	S.Awais .31.(QUSIT)	Ease labour after birth process	1	2	0.05	2	0.05
Fabaceae	*Trifolium repens* (L.)	Shawtal	H	S.Awais .61.(QUSIT)	Increase milk	1	5	0.125	5	0.12
Fabaceae	*Vachellia nilotica* (L.) P.J.H.Hurter & Mabb.	Kikar	T	S.Awais.30.(QUSIT)	Improve digestion and wound healing	2	5	0.125	10	0.25
Juglandaceae	*Juglans regia* L.	Ghuzz	T	S.Awais.27.(QUSIT)	Fainting	1	2	0.05	2	0.05
Lamiaceae	*Isodon rugosus* (Wall.) Codd	Sperkae	H	S.Awais.29.(QUSIT)	Pain killer	1	2	0.05	2	0.05
Lamiaceae	*Mentha longifolia* (L.) L.	Venaly	H	S.Awais.28.(QUSIT)	Off feed	1	3	0.075	3	0.08
Lythraceae	*Punica granatum* L.	Anar	T	S.Awais.57.(QUSIT)	Hepatitis	1	1	0.025	1	0.02
Malvaceae	*Gossypium arboreum* L.	Poomba	T	S.Awais.36.(QUSIT)	Coughing	1	1	0.025	1	0.02
Malvaceae	*Hibiscus rosa-sinensis* L.	Gull tooth	T	S.Awais.35.(QUSIT)	Increase milk					
Meliaceae	*Melia azedarach* L.	Toora shanday	T	S.Awais .37.(QUSIT)	Constipation	1	1	0.025	1	0.02
Moraceae	*Broussonetia papyrifera* (L.) Vent.	Gul tooth	T	S.Awais.41.(QUSIT)	Increase milk	1	2	0.05	2	0.05
Moraceae	*Ficus carica* L.	Injeer	S	S.Awais.40.(QUSIT)	Retain Placenta	1	2	0.05	2	0.05
Moraceae	*Morus alba* L.	Tooth	T	S.Awais .38.(QUSIT)	Constipation	1	2	0.05	2	0.05
Moraceae	*Morus nigra* L.	Toor tooth	T	S.Awais.39.(QUSIT)	Coughing	1	2	0.05	2	0.05
Myrtaceae	*Psidium guajava* L.	Amrood	T	S.Awais.34.(QUSIT)	Diarrhea	1	2	0.05	2	0.05
Myrtaceae	*Syzygium cumini* (L.) Skeels	Jaman	T	S.Awais .32.(QUSIT)	Dysentery	1	2	0.05	2	0.05
Nitrariaceae	*Peganum harmala* L.	Spelanay	H	S.Awais .79.(QUSIT)	Sub-normal temperature	1	3	0.075	3	0.08
Oleaceae	*Olea europaea* L.	Zeytoon	S	S.Awais.42.(QUSIT)	Colic	1	1	0.025	1	0.02
Oxalidaceae	*Oxalis acetosella* L.	Trevakay	H	S.Awais .43.(QUSIT)	Purification of blood	1	1	0.025	1	0.02
Papavereceae	*Pavonia schrenkiana*	Surgulay	H	S.Awais .62.(QUSIT)	Increase milk	1	2	0.05	2	0.05
Piperaceae	*Piper nigrum* L.	Toor mirch	T	S.Awais.63.(QUSIT)	Mastitis and gas	2	3	0.075	7	0.18
Poaceae	*Brachiaria reptans* (L.)	Kuray	H	S.Awais .44.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Poaceae	*Cymbopogon citratus* Stapf	Lemon grass	H	S.Awais.46.(QUSIT)	Hepatitis	1	2	0.05	2	0.05

Poaceae	*Cynodon dactylon* (L.) Pers.	Kabal	H	S.Awais.45.(QUSIT)	Increase milk	1	1	0.025	1	0.02
Poaceae	*Hordeum vulgare* L.	Warbashy	H	S.Awais.48.(QUSIT)	Increase milk	1	4	0.1	4	0.1
Poaceae	*Oryza sativa* L.	Wrejy	H	S.Awais .49.(QUSIT)	Weakness and diarrhea	2	8	0.2	15	0.38
Poaceae	*Pennisetum glaucum* R.Br.	Bajra	H	S.Awais .55.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Poaceae	*Saccharum officinarum* L.	Gannay	H	S.Awais.51.(QUSIT)	Hepatitis and purification of blood	2	10	0.25	20	0.05
Poaceae	*Saccharum spontaneum* L.	Nul	H	S.Awais.52.(QUSIT)	Cold tolerance	1	1	0.025	1	0.02
Poaceae	*Sorghum bicolor* (L.) Moench	Makayan	H	S.Awais .56.(QUSIT)	Increase milk	1	2	0.05	2	0.05
Poaceae	*Sorghum halepense* Pers.	Dadum	H	S.Awais .50.(QUSIT)	Ectoparasite	1	5	0.125	5	0.12
Poaceae	*Triticum aestivum* L.	Ganum	H	S.Awais.53.(QUSIT)	Weakness	1	5	0.125	5	0.12
Poaceae	*Zea mays* L.	Jowar	H	S.Awais.54.(QUSIT)	Increase milk	1	5	0.725	5	0.12
Polygonaceae	*Polygonum aviculare* L.	Knet grass	H	S.Awais.59.(QUSIT)	Anti-pyretic	1	2	0.05	2	0.05
Portulacaceae	*Portulaca oleracea* L.	Warkharay	H	S.Awais.58.(QUSIT)	Increase milk	1	2	0,05	2	0.05
Pteridaceae	*Adiantum capillus-veneris* L.	Patusana	H	S.Awais Bot.1.(QUSIT)	Fever and coldness	2	6	0.15	12	0.3
Rhamnaceae	*Ziziphus jujuba* Mill.	Elanay bera	S	S.Awais.64.(QUSIT)	Hepatitis	1	2	0.05	2	0.05
Rhamnaceae	*Ziziphus sativa* (Mill) (L.)	Markhany	T	S.Awais.65.(QUSIT)	Increase milk	1	3	0.075	3	0.08
Rosaceae	*Prunus persica* (L.) Batsch	Nashpaty	T	S.Awais.66.(QUSIT)	Gastro-intestinal motility	1	5	0.0125	5	0.12
Rutaceae	*Citrus aurantium* L.	Narang	T	S.Awais .67.(QUSIT)	Blotting	1	4	0.1	4	0.1
Rutaceae	*Citrus limon* (L.) Osbeck	Laimbo	S	S.Awais .68.(QUSIT)	Mastitis	1	3	0.075	3	0.08
Rutaceae	*Citrus sinensis* (L.) Osbeck	Malta	T	S.Awais.69.(QUSIT)	Coughing	1	2	0.05	2	0.05
Salicaceae	*Populus alba* L.	Sufaidar	T	S.Awais .74.(QUSIT)	Increase milk	1	2	0.05	2	0.05
Salicaceae	*Salix tetrasperma* Roxb.	Harwala	T	S.Awais.23.(QUSIT)	Fever, and stone in bladder	2	3	0.075	6	0.15
Sapindaceae	*Dodonaea viscosa* L.	Gawaraskay	S	S.Awais .73.(QUSIT)	Skin infection	1	2	0.05	2	0.05
Simaroubaceae	*Ailanthus altissima* (Mill.) Swingle	Faramy shandy	T	S.Awais.72.(QUSIT)	Increase milk	1	1	0.025	1	0.02
Solanaceae	*Capsicum annuum* L.	Marchaky	H	S.Awais.71.(QUSIT)	Mastitis and feeding	2	6	0.75	12	0.3
Solanaceae	*Nicotiana tabacum* L.	Tamakoo	S	S.Awais.70.(QUSIT)	External injury	1	3	0.075	3	0.08
Tamaricaceae	*Tamarix aphylla* (L.) H.Karst	Ghazz	T	S.Awais.75.(QUSIT)	Milky fever	1	3	0.075	3	0.08

Verbenacae	*Verbena stramarium* L.	Shamaky	H	S.Awais.77.(QUSIT)	Analgesic	1	5	0.725	5	0.12
Vitaceae	*Vitis vinifera* L.	Kishmish	T	S.Awais.76.(QUSIT)	External injury	1	3	0.075	3	0.08
Zingiberaceae	*Elettaria cardamomum* (L.) Maton	Sabaz lachi	T	S.Awais.33.(QUSIT)	Weakness and Babesiosis	2	8	0.2	16	0.4
Zygophyllaceae	*Tribulus terrestris* L.	Karkunday	H	S.Awais.78.(QUSIT)	Increase milk	1	2	0.05	2	0.05

Legend:

Habit: H = Herb, T = Tree, S = Shrub, C= Climber; **FC:** Frequency Citation; **RFC:** Relative Frequency Citation; **UV:** Use Value

Table 4. The ethnoveterinary applications and diverse details pertaining to the plants.

Ethnoveterinary uses	No	Percentage	Ethnoveterinary uses	No of Species	Percentage
Increase milk	23	18.17	Antiseptic	1	0.79
Hepatitis	6	4.7%	Anthelmintic	1	0.79
Dietary diarrhea	5	3.95	Anti-Stomach	1	0.79
Constipation	4	3.16	Skin infection	1	0.79
Off Feeding	3	2.37	Dysentery	1	0.79
Mastitis	3	2.37	Baessiosis	1	0.79
Coughing	3	2.37	Urinary bladder disorder	1	0.79
Colic	3	2.37	Retain placenta	1	0.79
Fever	2	1.58	Fainting	1	0.79
Mouth and Foot tympany	2	1.58	Pain killer	1	0.79
Purification of Blood	2	1.58	Gastrointestinal motility	1	0.79
Coldness	2	1.58	Subnormal temperature	1	0.79
Weakness	2	1.58	Antipyretic	1	0.79
Milky fever	1	0.79	Gas	1	0.79
Eye disease	1	0.79	Stone in bladder	1	0.79
Improve Digestion	1	0.79	Milk thistle	1	0.79
Wound healing	1	0.79	Ectoparasite	1	0.79
Ease Labour after the birth process	1	0.79	Stomach analgesic	1	0.79
Blood in milk	1	0.79	External injury	1	0.79
Blotting	1	0.79	Analgesic	1	0.79
Vaginal Prolapsed	1	0.79			

Table 5. Habit-Wise Distribution of Plants.

Habit name	Number	Percentage %
Herbs	47	37.13
Trees	26	20.54
Shrubs	04	3.16
Climbers	02	1.58

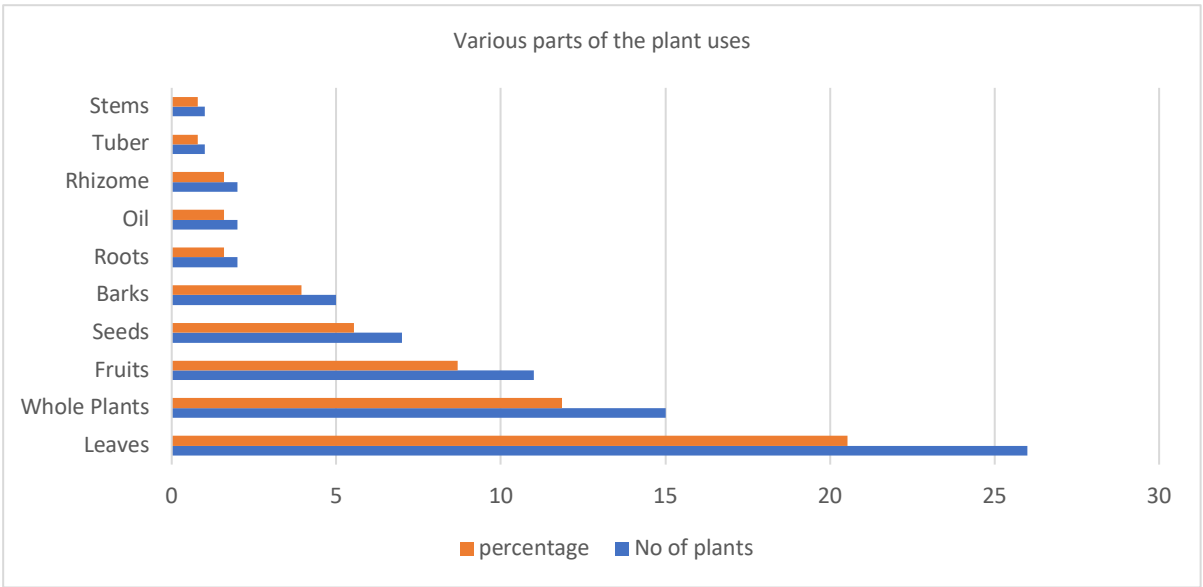

Figure 2. Uses of plants parts.

Cured Diseases

Most of the people in the research area are correlated with plants. They were keeping various animals for different aims of life. They obtained milk, lather is used for different purposes in agriculture, the population of the research area depend on animal these animals were treated with the help of medicinal plants.

The research project shows the use of plants in the treatment of various diseases focusing on 41 different diseases (Table 3). Specifically for major ailments, the plants are used to address conditions such as increasing milk production, hepatitis, diarrhea (both dietary and non-dietary), mastitis, bloating, gastrointestinal motility, mouth and foot tympany, gas, off-feeding, cold tolerance, antipyretic (fever reduction), subnormal temperature, fever, and analgesic (pain relief). Furthermore, that there are 23 different plants that are specifically used in the treatment of increasing milk production, while 56 plants are employed in treating more than one disease. It's intriguing to explore the potential medicinal properties of these plants and their effectiveness in addressing such a diverse range of ailments. The Poaceae family boasts the highest diversity with 12 plant species, followed by the Fabaceae with 7 species. Local residents utilize various parts such as leaves, fruits, seeds, stems, roots and others from these plants to make a wide range of products. That are applied physically and chemically (Fig. 1).

Use value

Each plant in the study has its use value evaluated and the importance of the species with the greatest use values was generally examined. (Table 3) contain the use value (0.2) *Elettaria cardamomum*, (0.2) *Oryza sativa,* (0.1) *Citrus aurantium*, (0.1) *Hordeum vulgare* and (0.1) of *Cyperus rotundus* etc.

RFC Value

The relative frequency is being used to calculate the ratio of informants who revealed the use of certain plants (FC) to the total number of informants for all plants surveyed (N). The species with the highest RFC values are as follows: *Elettaria cardamomum* (RFC = 0.2), *Hordeum vulgare* (RFC = 0.1), *Cyprus rotundas* (RFC = 0.1), *Citrus aurantium* (RFC = 0.1). These RFC values represent the relative number of informants mentioning the uses of these plants compared to the number of people in the study (Table 3).

Pearson correlation value

The Pearson correlation coefficient, denoted as 'r,' was determined to be equal to 0.77784. This value indicates a strong positive correlation between the two variables being analyzed. A correlation coefficient of 0.77784 suggests that there is a relatively high positive linear relationship between the x variable (RFC, as you mentioned) and the other variable. In summary, the value of 0.77784 for the Pearson correlation coefficient indicates a strong positive correlation, suggesting that as the x variable (RFC) increases, the other variable also tends to increase.

Discussion

Plants are crucial for the well-being of living organisms, including humans and animals. Ethnoveterinary medicine, which involves treating livestock with herbal medicines instead of synthetic drugs, is indeed an important aspect of animal healthcare. According to Yipel *et al., (*2017) studied 67 plant which is able to cure different disease of Livestock 26% plants ware used in gastrointestinal problems. *Rumex hastatus* were reported for treatment of skin in cattle. *Plantago lanceolata*, *Polygonum herbata* and *Chenopodium album* were reported for easy delivery releases of placenta, *Solanum surrattense* were noted for pregnancy. Dhayapria and Senthil kumar (2016) reported 25 species of 23 genera are utilized for the treating a variety of plants ailments such as diarrhea, dysentery, cut injury, fever and other hemorrhagic swelling. According to Ayeni and Basiri (2018) found that 30 species used to cure various ailments of livestock leaves of 61.29 % along with bark (25.80%) and root (6.45%) in various plants.

The research project conducted in the three main localities of Takht Bhai, including Jalala, Made-e-Baba, and Takkar, focused on studying and documenting plant species and their uses in ethnoveterinary practices. A total of seventy-nine plants studied belonging to different families were collected, preserved, labeled, and mounted on Herbarium sheets. Among the families Poaceae are the leading family followed by Fabaceae. A similar study was conducted by Parveen *et al*., (2021) and concluded that Poaceae was the dominant family followed by Asteraceae and Fabaceae which support our findings. Out of these 79 species 47 were identified as herbs, 26 as trees, 4 as shrubs and 2 as climbers (Table 5). The ethnoveterinary study revealed the various parts of the plants used in treating different animal diseases by the people in the area. Specifically, the leaves of 26 plant species, 15 whole plants, 5 plants barks, roots of 2 species, the oil of 2 species, the tuber of 1 species, the stem of 1

species, the rhizome of 1 species, and the fruit of 7 species were found to have medicinal uses (Fig. 2). The findings of the study indicated that 23 plant species were used to increase milk production, 6 species were used for treating Hepatitis, 5 species for dietary diarrhea, 4 species for constipation, 3 species for coughing, 3 species for mastitis (inflammation of the udder in animals), 3 species for off-feeding, 2 species for weakness, 2 species for blood purification, 2 species for cold tolerance, 1 species for milky fever, 1 species for eye diseases, 1 species for improving digestion, 1 species for gastrointestinal motility, 1 species reported as analgesic, and 1 species investigated for its stomach analgesic properties (Table 4).

According to Patel *et al.,* (2015), he studied 25 plants of 23 genera belong to14 various families of are applied to cow ailments. Mussarat *et al.,* (2014) studied a similar research project that identified 43 plants belong to 26 genera for the identification of bovine disorder such as lactation and wound healing. Yirga *et al*., (2012) regarding the veterinary uses of various plant species, according to their study, they documented twenty-two species of plants that are commonly used in veterinary medicine. These plants were primarily collected from the wild and are utilized to treat different diseases in cattle. Based on their findings, the leaves of these plant species are predominantly used in the treatment of cattle diseases. The drugs derived from these leaves can be administered to the animals through various routes, including nasal, oral, and dermal routes.

According to Aziz *et al*., (2018) reports the plants for the use of ethnoveterinary specifically focusing on 73 plants. Among these, the most widely used ethnoveterinary plants with maximum reported usage were *Visnaga daucoides* Gaertn., *Foeniculum vulgar* Mill, *Solanum virginianum* L., *Withania somnifera* (L.) Dunal, *Glycyrrhiza glabra* L. and *Curcuma longa* L. These plants are able to cure ethno-livestock practices for various purposes. Additionally, new medicinal values were discovered for certain species, including *Heracleum candicans a*nd *Glycyrrhiza glabra*. However, the citations and specific details regarding these new medicinal values are mentioned as confidential. The leading family with a high number of medicinal plants was Apiaceae, which had 7 species among the reported plants. Furthermore, a significant number of medicinal plants (32) were used for gastric problems, indicating their efficacy in treating such issues. The Fidelity Level was recorded to assess the effectiveness of these plants for different disorders. The highest Fidelity level was reported for dermatological disorders (0.97), followed by reproductive disorders (0.93) and gastrointestinal disorders (0.92). This suggests that these ethnoveterinary plants are commonly employed and have a high-fidelity level in treating dermatological issues. Finally, the main route of administration for these remedies was oral, indicating that the plants were typically consumed or administered orally for their therapeutic effects.

Conclusion

The exploration of ethnoveterinary medicine in Takht bhai underscores the reliance on plant-based remedies to address animal ailments, recognizing the vital role of animals within the local ecosystem. Through extensive interviews, observations, and questionnaires, a rich repository of knowledge concerning 79 plants across 46 families was meticulously documented and preserved, showcasing the diverse array of herbs, trees, shrubs, and climbers employed in treating various animal diseases. Particularly noteworthy was the efficacy of herbs in combating critical illnesses like hepatitis, diarrhea, mastitis, and gastrointestinal issues. This indigenous knowledge not only emphasizes the potential of local flora in maintaining livestock health but also presents an opportunity for developing sustainable healthcare solutions crucial for rural communities reliant on animal husbandry.

Declarations

List of abbreviations: H: Herb, **T:** Tree, **S:** Shrub, **C:** Climber, **FC:** Frequency Citation, **RFC:** Relative Frequency Citation, **UV:** Use Value, **QUSIT:** Qurtuba University of Science and Information Technology.

Ethics approval and consent to participate: All the participants provided prior informed consent before the interviews.

Consent for publication: Oral permission from each participant.

Availability of data and materials: Not applicable

Competing interests: All the authors declared that they have no competing interests.

Funding: Not applicable

Author contributions: S.A.S. collected the data, analyzed it, and wrote the text. M.A. monitoring data collection and analysis. A.M. prepared graphs and tables, and H.U. wrote the final version of the manuscript.

Acknowledgements

We are cordially thankful to the people of local area to share their valuable information about the plants.

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