Ethnoveterinary plant knowledge and traditional livestock healthcare practices in the Kangra District, Western Himalayas, India

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Research

Abstract

Background: Traditional knowledge plays an important role in the well-being of humans and livestock in the far-flung Himalayan regions. However, much of this knowledge remains undocumented and is at the risk of being vanished. The aim of the present study was to explore and document the traditional knowledge of ethnoveterinary practices in Kangra region of Himachal Pradesh, India.

Methods: Ethnoveterinary data were collected during field surveys conducted in 2021-2022 using a pre-structured questionnaire, direct interviews, and group discussions. A snowball sampling method was used to identify knowledgeable informants. Quantitative ethnobotanical indices, including use-value, fidelity level, and informant consensus factor, were used to assess the cultural importance and agreement on plant use for livestock ailments.

Results: During the present study, 79 local respondents were interviewed. A total of 71 plant species belonging to 40 families were documented for treating livestock ailments. Out of these, most plant species were herbs (27), followed by trees (25) and shrubs (13). Fabaceae was the most frequently reported family, represented by six plant species. Leaves were the most used plant part, and remedies were mainly prepared as juice, paste, decoction, infusion, extract, or administered directly. High ICF and FL values indicated strong community agreement on the use of specific plant species for particular ailments.

Conclusions: The study highlights the continued reliance of rural communities in the Kangra region on ethnoveterinary plant knowledge for livestock healthcare. Systematic documentation of this knowledge is essential for its preservation and for supporting biocultural conservation and sustainable livestock management practices.

Keywords: Livestock healthcare, ethnoveterinary, Fabaceae, Kangra, Western Himalayas.

Background

The Indian Himalayan region (IHR) represents one of the most biologically diverse mountain systems, supporting approximately 10,000 plant species, of which 3,160 are endemic (Rana & Rawat 2017). The communities inhabiting the IHR depend extensively on local biodiversity for multiple purposes, including food, fuel, medicine, timber, fiber, agricultural tools,

cultural practices, and other daily needs (Malhotra *et al.* 2021, Kumar & Gupta 2023, Pandey *et al.* 2024, Ahluwalia *et al.* 2025). Himachal Pradesh, located within this region, comprises diverse ecological zones extending from subtropical foothills to temperate and alpine ecosystems (Kumar *et al.* 2017, Sharma *et al.* 2025). These ecological gradients support diverse plant communities and sustain mixed farming systems where crop cultivation and livestock rearing are closely integrated. According to the report of Government of Himachal Pradesh (2021-22), a large proportion of the population resides in rural areas, where agriculture and allied activities form the primary livelihood base (Report 2021-22). Animal husbandry plays a central role in these rural economies by providing milk, meat, wool, manure and animal power (Pandey *et al.* 2024). In remote mountainous areas, households continue to rear cattle, buffalo, goats, and sheep to support subsistence and income needs (Devi 2018).

Ethnoveterinary medicine refers to a system based on folk beliefs, traditional knowledge, and practices used by local communities to prevent and treat of livestock diseases such as such as gastrointestinal infections, reproductive problems and parasitic diseases which are common among livestock (Akerreta *et al.* 2010, Howland 2021, Iqbal 2024). This knowledge system has developed through long-term interactions between people, animals, and surrounding environment, and is primarily transmitted orally across generations (Akerreta *et al.* 2010, Bishist *et al.* 2022). In remote Himalayan regions, plant-based veterinary remedies form an integral component of livestock healthcare strategies, particularly where access to modern veterinary services is limited by geography or cost (Samal *et al.* 2004, Shen *et al.* 2010, Amri & Kisangau 2012, Pandey *et al.* 2024). Globally, as livestock production expands to meet rising demands, ethnoveterinary medicine offers an accessible and safe alternative for sustaining animal health (Abubakar *et al.* 2020, Howland 2021, Iqbal 2024).

While numerous studies have documented medicinal plant use in various parts of the world by (Gazzaneo *et al.* 2005, Chinsembu *et al.* 2014, Jamila & Mostafa 2014, Eshetu *et al*. 2015, Ijaz *et al.* 2016), and within other districts of Himachal Pradesh by (Raghuvanshi *et al.* 2021, Radha *et al.* 2021, Roy *et al.* 2022, Arya *et al.* 2023, Dadhwal *et al.* 2025), the systematic documentation of ethnoveterinary practices in the Kangra remains comparatively limited. This absence of documentation is particularly due to rapid cultural changes, urbanization, and declining interest among the present generations, which place this oral heritage at risk of vanishing (Redvers *et al.* 2023, Malapane *et al.* 2024).

Kangra presents a complex landscape, situated in the Shivalik foothills with the Dhauladhar range forming its prominent northern boundary. The district covers an area of 5739 km^2, representing approximately 10.31% of the total geographical area of Himachal Pradesh (Ganguly *et al.* 2015). According to Gupta (2013), the altitude of district Kangra ranges from 500 to 5500 m from the sea level. Being the highest populated district of Himachal Pradesh, about 82% of the populations depends on agriculture and allied activities for livelihood (Bhatti 2013). The climate varies from sub-tropical to sub-humid, with average annual rainfall of 1751 mm. These environmental and socioeconomic characteristics create conditions in which livestock rearing and plant resource use remain closely interconnected.

In this context, the present study aims to bridge the regional documentation gap by recording ethnoveterinary plant knowledge in the Kangra and analyzing patterns of use plant use in relation to livestock ailments. Additionally, the study evaluates the cultural relevance and degree of agreement among informants using quantitative ethnobotanical indices, including Use Value (UV), Fidelity Level (FL), and Informant Consensus Factor (ICF). By combining qualitative documentation with quantitative analysis, this research contributes to understanding the role of traditional veterinary practices within the socio-ecological systems of the Western Himalayas.

Materials and Methods

Study area

The present study was conducted in Kangra situated in Himachal Pradesh, India. The area includes diverse ecological zones and experience temperatures ranging from 0-38 °C annually (Suratia *et al.* 2015, Kumari *et al.* 2022) (Fig. 1). These environmental gradients support diverse vegetation types, involving combined population of Himalayan moist temperate forests, subtropical pine forests and tropical dry deciduous forests (Upgupta *et al.* 2015). Agriculture and allied activities, such as livestock rearing are recognized as the primary livelihood sources for majority of the population, aligning with the findings of (Meenakshi *et al*. 2024). Livestock such as cows, buffaloes, goats, and sheep constitute an important component of household subsistence and income generation. The availability of diverse plant resources across agricultural fields, forest margins, and village surroundings contributes to the continued use of ethnoveterinary remedies in the region.

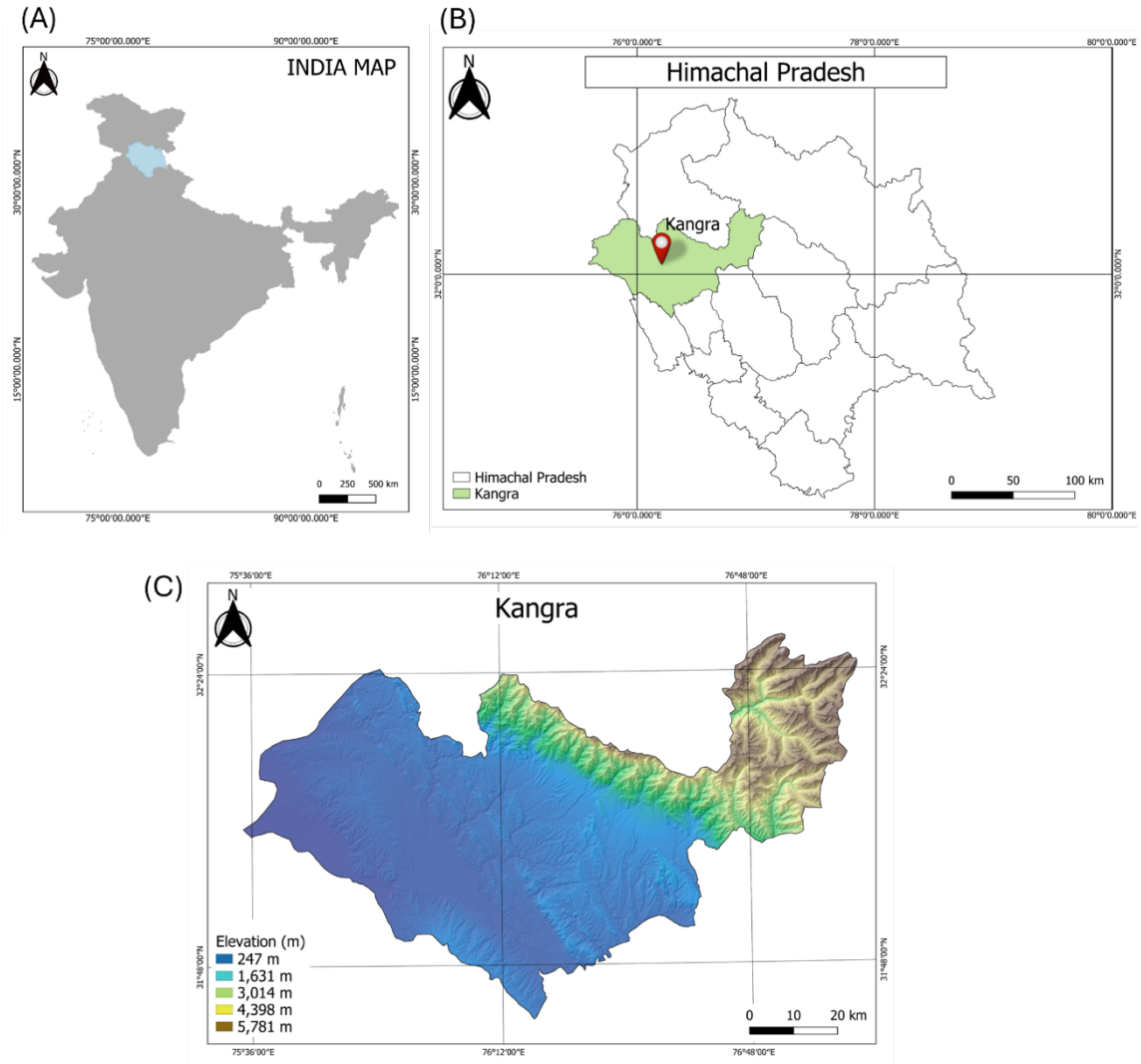

Figure 1. Location and topography of the study area, Kangra district, Himachal Pradesh, India. (A) Map of India showing the location of Himachal Pradesh. (B) Map of Himachal Pradesh highlighting the study district, Kangra. (C) Topographic map of Kangra district showing elevation variation derived from SRTM digital elevation data (NASA Shuttle Radar Topography Mission; NASA, 2013).

Data collection

Field survey was conducted in Kangra during 2021-2022. Ethnoveterinary information was collected using a combination of pre-structured questionnaire, direct interviews, and group discussions (Radha *et al*. 2019) with local inhabitants of the selected rural area. This approach was used to obtain both detailed individual knowledge and shared community perspectives.

A total of 79 individuals with diverse sociodemographic characteristics participated in the study (Table 1). Informants were selected using a snowball technique, starting with locally recognized livestock keepers and individuals identified by village leaders as knowledgeable about traditional healthcare practices related with animals. Other participants were identified with the help of initial informants. Sampling was continued until the information saturation was reached, i.e., a point at which no new plant species or uses were reported. Participants included both male and female community members. Information regarding local names of the plants, plant parts used, methods of remedy preparation, mode of administration and disease treated was recorded to examine patterns of knowledge distribution. Informants were grouped into age categories to assess variation in reported plant knowledge across generations. Interviews were conducted in local language, including Pahari and Hindi and notes were recorded. Participation was entirely voluntary, and verbal informed consent was obtained from all participants before interviewing. The scientific nomenclature of the recorded plant species was verified using "The World Flora Online" online database (https://www.worldfloraonline.org/).

Table 1. Sociodemographic characteristics of informants.

Demographic variable	25-35 yrs	36-45 yrs	46-55 yrs	56-65 yrs	66-78 yrs
Number of informants	11	15	22	20	11
Education level					
9^{th}-10^{th} class	11	13	13	2	0
6^{th}-8^{th} class	0	2	3	8	4
1^{st}-5^{th} class	0	0	4	6	4
Never attended school	0	0	2	4	3

n=79, yrs=years (represent age of the informant).

Data Analysis

Ethnobotanical data was analyzed using descriptive statistics to summarize informant demographics and plant use patterns. To assess the cultural relevance and degree of agreement regarding plant use, three widely applied quantitative ethnobotanical indices (Ritter *et al.* 2012) were calculated: use value (UV), fidelity level (FL), and informed consensus factor (ICF).

Use Value (UV)

UV was calculated to estimate the relative significance of each plant species based on the number of citations/use-reports provided by the respondents (Phillips & Gentry 1993). In the present study, each citation of a plant species for a particular ailment was counted as one use-report. If an informant mentioned the same species for multiple ailments, each use was recorded separately.

The UV was calculated using the following formula:

$$UV=\sum Ui/n$$

where n is the total number of informants and U_i is the number of citations for a given species. Higher UV indicated that a plant species was cited more frequently by the respondents.

Fidelity Level (FL)

The FL index was used to evaluate the degree of specificity with which a plant species is used for a particular livestock ailment/condition (Mussarat *et al.* 2014, Tumoro & Maryo 2016).

$$FL=Np/Nu\times100\%$$

where, N_u is the total number of respondents who mentioned the species for any ailment and N_p is the number of respondents citing a plant for a specific condition.

FL was calculated only for the most frequently cited species (those with the highest number of use-reports) to avoid distortions from rarely cited species. The fidelity level of 11 popular ethnoveterinary plant species has been determined. Higher FL value indicates stronger agreement among informants regarding the use of a plant for a specific ailment.

Informant Consensus Factor (ICF)

ICF was calculated to evaluate the level of agreement among informants regarding plant used within defined ailment categories (Uddin and Hassan 2014). Before calculating ICF, reported livestock ailments were categorised and were subdivided into other disease categories. Based on similarity of symptoms and local terminology, diseases were categorised into groups such as oral disorders, foot and mouth disease, eye disorders, parasitic diseases, cold, gynecological, andrological and urogenital, dermatological and related problems, gastrointestinal, poisoning and others (Heinrich *et al.* 1998, Ritter *et al.* 2012).

ICF was calculated using the formula:

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

where N_{ur} is the number of use reports in a particular ailment category, and N_t is the number of plant species used for that category.

High ICF values indicate strong agreement among respondents and high cultural relevance of plant species. While low ICF score (around zero) suggests that respondents have varying opinions on which plant species should be used to treat a specific ailment (Gazzaneo *et al.* 2005).

Results

Sociodemographic profile of the informants

A total of 79 respondents (28 women and 51 men) were interviewed. Participants were grouped into five age categories (Table 1). Most informants belonged to the 46-55 and 55-65 age groups. Variation in formal education level was observed across age categories. Younger participants generally had higher levels of formal education, whereas older informants often had primary education or no formal schooling. Despite these differences, older informants reported a great number of plant species and use-reports compared to younger participants, indicating variation in ethnoveterinary knowledge distribution across age groups.

Ethnoveterinary use of plants

A total of 71 plant species belonging to 40 botanical families were documented for the treatment of livestock ailments in Kangra region. These remedies were primarily applied to commonly reared animals such as cattle, buffaloes, sheep and goats. The documented plants were used for a wide range of conditions, including skin infections, gastrointestinal disorders, reproductive problems, wounds, parasitic infections and others (Fig. 2, Table 2). The most represented family was Fabaceae (6 species), followed by Moraceae (5 species) and Rutaceae (4 species) (Fig. 2).

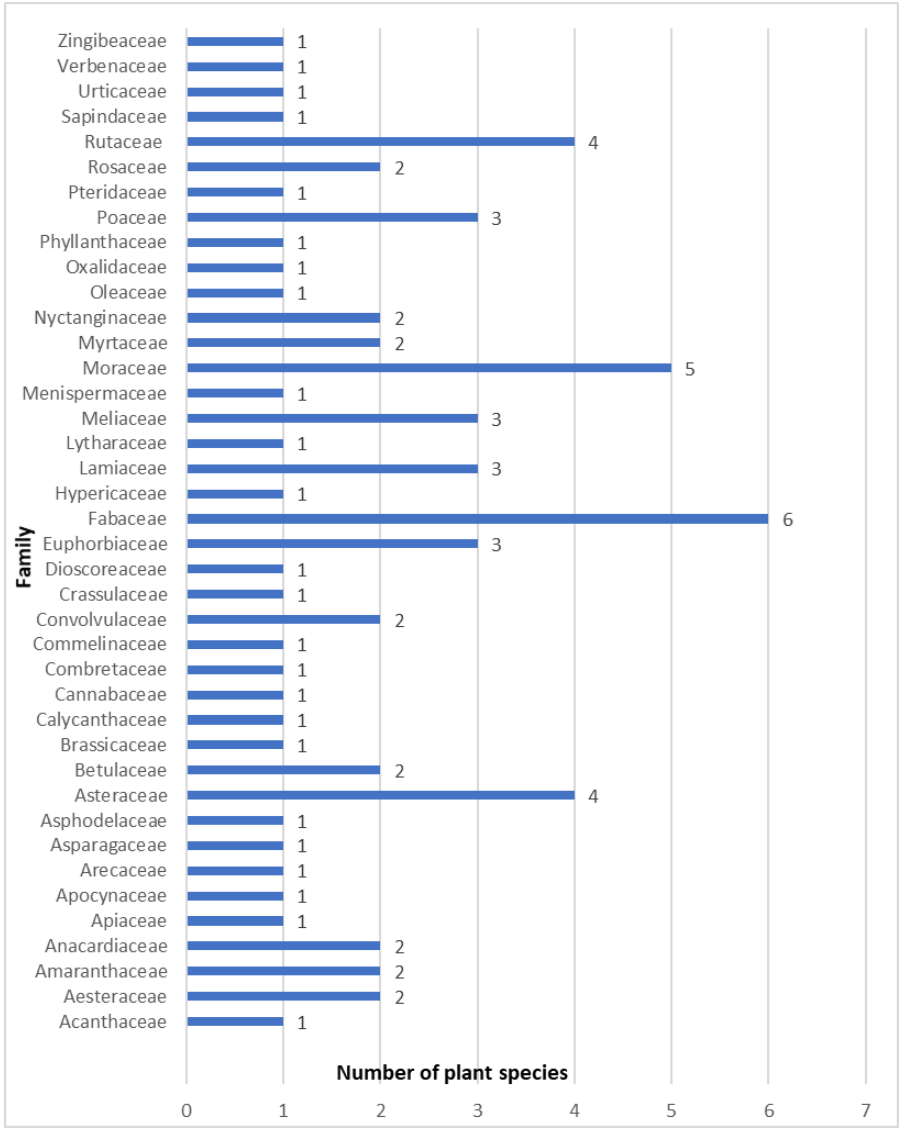

Figure 2. Representation of different families along with of plant species collected from study site.

Table 2. Ethnoveterinary plants used at study site.

Family	Botanical name	Voucher no.	Common name	Growth form	Part used	Animal treated	Preparation method and route of administration	Ailments treated (with no. of citations)	UV
Acanthaceae	*Justicia adhatoda* L.	SUBMS/BOT-4738	Basuti	Shrub	Leaves	C, G	Administered orally	Dysentery (37)	0.46
Aesteraceae	*Ageratum conyzoides* (L.) L.	SUBMS/BOT-4708	Gha buti	Herb	Whole plant	C, G, B	Administered orally	Wounds (18), intestinal infections (23)	0.51
	Bidens pilosa L.	SUBMS/BOT-4714	Kumra	Herb	Leaves	C, G	Paste, applied topically	Body weakness (39)	0.49
Amaranthaceae	*Amaranthus viridis* L.	SUBMS/BOT-4710	Chulai	Herb	Whole plant with wheat husk	C, G, B	Crushed whole plant with wheat husk, administered orally	Body weakness (32)	0.40
	Chenopodium album L.	SUBMS/BOT-4665	Bathuwa	Herb	Whole plant	C, B	Paste, applied topically	Piles (7), sore eyes (21), intestinal worms (13)	0.51
Anacardiaceae	*Mangifera indica* L.	SUBMS/BOT-4680	Aam	Tree	Leaves	B, G	Extract, administered orally	Mouth and foot diseases (29), eye diseases (21)	0.63
	Spondias sp.	SUBMS/BOT-4702	Amru	Tree	Leaves	C, B	Administered orally	Dystocia (22), retained placenta (21)	0.54
Apiaceae	*Eryngium foetidum* L.	SUBMS/BOT-4671	Ban dhania	Herb	Whole plant	G	Extract, administered orally	Worm infestation (12), skin infections (19)	0.39
Apocynaceae	*Calotropis gigantea* (L.) Dryand.	SUBMS/BOT-4717	AAk	Shrub	Aerial part (Latex)	C, G, B	Latex, dried leaf powder, administered orally	Retained placenta (16), and aerial part for milk production (13), indigestion (27)	0.70
Arecaceae	*Phoenix reclinata* Jacq.	SUBMS/BOT-4687	Khajoor	Shrub	Leaves	G	Administered orally	Eye disorders (31)	0.39

Asparagaceae	*Asparagus racemosus* Willd.	SUBMS/BOT-4711	Shatavri	Herb	Whole plant	G, C	Administered orally	Gynaecological problems (31), milk production (20)	0.64
Asphodelaceae	*Aloe vera* (L.) Burm.f.	SUBMS/BOT-4709	Shatavri	Herb	Leaves with turmeric	G, C	Extract, applied topically	Maggot wounds (43)	0.54
Asteraceae	*Ageratina adenophora* (Spreng.) R.M.King & H.Rob.	SUBMS/BOT-4647	Banmara	Herb	Leaves	G, B	Paste, applied topically	Skin pus (19), wounds (20)	0.49
	Crepis paludosa (L.) Moench	SUBMS/BOT-4669	-	Herb	Whole plant	G, C	Administered orally	Milk production (27)	0.34
	Erigeron bonariensis L.	SUBMS/BOT-4729	-	Herb	Whole plant	C, G, B	Administered orally	Stomach pain (19), urinary disorders (20)	0.49
	Tagetes erecta L.	SUBMS/BOT-4761	Genda	Herb	Whole plant	C, G, B	Paste, applied topically	Skin infection (32), stop bleeding from horns (24)	0.70
Betulaceae	*Betula papyrifera* Marshall	SUBMS/BOT-4653	Birch	Shrub	Bark	G, C	Dried powder, administered orally	Dysentery (18), diarrhea (17)	0.44
	Betula pubescens Ehrh.	SUBMS/BOT-4654	Birch	Tree	Bark	G, C	Extract, administered orally	Gastrointestinal disorders in cattle (33)	0.41
Brassicaceae	*Brassica nigra* (L.) K.Koch	SUBMS/BOT-4656	Kalli sarsoon	Herb	Whole plant	C, B	Administered orally	Hoof diseases (7), broken horns (11), dysentery (9), mouth blisters (12)	0.49
Calycanthaceae	*Calycanthus floridus* L.	SUBMS/BOT-4658	Flori	Shrub	Bark	G, C, B	Extract, applied topically	Sores on skin (29)	0.36
Cannabaceae	*Cannabis sativa* L.	SUBMS/BOT-4719	Bhang	Herb	Leaves	C, G, B	Paste, administered orally	Inflammation (21), expel intestinal worms (28)	0.62
Combretaceae	*Terminalia bellirica* (Gaertn.) Roxb.	SUBMS/BOT-4762	Bheda	Tree	Fruits	B, G	Dried powder, administered orally	Gastric disorders (41), diarrhea (21)	0.78

Commelinaceae	*Commelina* sp.	SUBMS/BOT-4724	Kana	Herb	Whole plant	G	Paste, administered orally	Inflammation (38)	0.48
Convolvulaceae	*Cuscuta reflexa* Roxb.	SUBMS/BOT-4726	Amar bel	Climber	Whole plant	C, G, B	Paste, administered orally	Foot and mouth diseases (56)	0.70
	Ipomoea carnea Jacq.	SUBMS/BOT-4734	Behaya	Shrub	Leaves	C, G, B	Paste, infusion, applied topically	Fly infestation (24), mosquito repellent (15)	0.49
Crassulaceae	*Bryophyllum pinnatum* (Lam.) Oken.	SUBMS/BOT-4739	Patharchur	Herb	Leaves	G	Extract, applied topically	Wound (23), snake bite (11)	0.43
Dioscoreaceae	*Dioscorea bulbifera* L.	SUBMS/BOT-4670	Zimikand	Herb	Whole plant	C, G, B	Applied topically	Worm infected wounds (44)	0.55
Euphorbiaceae	*Euphorbia hirta* L.	SUBMS/BOT-4731	Dudhli	Herb	Whole plant	C, G, B	Paste, administered orally	Diarrhea (22), fever (11)	0.41
	Jatropha curcas L.	SUBMS/BOT-4737	Ratanjot	Tree	Leaves	G, C, B	Extract, administered orally	Wound healing (17), intestinal worms (22)	0.49
	Ricinus communis L.	SUBMS/BOT-4751	Arandi	Shrub	Seeds	B, G	Oil, administered orally	Gastric problems (46)	0.58
Fabaceae	*Bauhinia variegata* L.	SUBMS/BOT-4652	Kachnar	Tree	Flowers, Leaves	C, G, B	Paste, applied topically	Foot and mouth diseases (48)	0.60
	Cassia fistula L.	SUBMS/BOT-4720	Amaltas	Tree	Pods	C, B, G	Dried powder, extract, administered orally	Expel intestinal worms (15), inflammation (9), skin infections (13)	0.46
	Dalbergia sissoo DC.	SUBMS/BOT-4728	Shisham	Tree	Leaves	G	Administered orally	Diarrhea (18), mouth infections (23)	0.51
	Melilotus altissimus Thuill.	SUBMS/BOT-4681	Khandai	Herb	Whole plant	G, C	Administered orally	Indigestion (17), stomach pain (18).	0.44
	Senna tora (L.) Roxb.	SUBMS/BOT-4754	Chakunda	Herb	Leaves	C, G, B	Paste, applied topically	Skin disorders (17), wounds (9), cuts (13)	0.49

	Trifolium sp.	SUBMS/BOT-4765	Barseem	Herb	Whole plant	C, G, B	Administered orally	Increase milk production (48)	0.60
Hypericaceae	*Hypericum perforatum* L.	SUBMS/BOT-4677	Choli phulya	Herb	Whole plant	C, B, G	Oil, applied topically	Wounds (13), injuries (28)	0.51
Lamiaceae	*Mentha arvensis* L.	SUBMS/BOT-4741	Pudina	Herb	Leaves	G, C, B	Paste with rock salt, administered orally	Dysentery (44)	0.55
	Ocimum sanctum L.	SUBMS/BOT-4744	Tulsi	Herb	Leaves, Whole plant	G, C, B	Paste, fed with honey, administered orally	Scabies (16), weight gain (30)	0.58
	Vitex negundo L.	SUBMS/BOT-4767	Bana	Shrub	Whole plant	C, G, B	Administered orally	Mange (19), stomach pain (42)	0.77
Lytharaceae	*Punica granatum* L.	SUBMS/BOT-4750	Anar	Tree	Leaves	G	Paste with milk, administered orally	Expel worms (8), wounds (14), diarrhea (11), poisoning (9)	0.53
Meliaceae	*Azadirachta indica* A.Juss.	SUBMS/BOT-4712	Neem	Tree	Leaves	G, C, B	Extract, administered orally	Expel intestinal worms (22), inflammations (11), wounds (19)	0.65
	Cedrela odorata L.	SUBMS/BOT-4722	Cedar	Tree	Bark	C, G, B	Infusion, administered orally	Diarrhea (26), inflammation (14)	0.50
	Toona ciliata M.Roem.	SUBMS/BOT-4764	Toon	Tree	Whole plant	C, G, B	Administered orally	Gastro disorders (41)	0.51
Menispermaceae	*Tinospora cordifolia* (Willd.) Miers	SUBMS/BOT-4763	Giloya	Vine	Whole plant	G, B, C	Paste, applied topically	Skin infections (55)	0.69
Moraceae	*Broussonetia papyrifera* (L.) L'Her. ex Vent.	SUBMS/BOT-4657	Jangli tut	Shrub	Leaves	C, B	Administered orally	Increase milk production (40)	0.50
	Ficus carica L.	SUBMS/BOT-4673	Anjeer	Tree	Fruits	B, C	Powder, administered orally	Constipation (9), urinary bladder disorders (17), placental emission (11)	0.46

	Ficus religiosa L.	SUBMS/BOT-4732	Peepal	Tree	Bark	C, B	Decoction, administered orally	Removal of retained placenta (44)	0.55
	Morus alba L.	SUBMS/BOT-4682	Shehtoot	Tree	Leaves	G, C, B	Extract, applied topically	Mastitis (39)	0.49
	Morus nigra L.	SUBMS/BOT-4742	Tut	Tree	Leaves	G,C,B	Powder, administered orally	laxative (27), tonic (14)	0.51
Myrtaceae	*Eucalyptus globulus* Labill.	SUBMS/BOT-4730	Safeda	Tree	Leaves	B	Extract, administered orally	Cold (27), fever (16)	0.54
	Syzygium cumini (L.) Skeels	SUBMS/BOT-4760	Jamun	Tree	Leaves	C, B	Paste, administered orally	Diarrhea (50)	0.63
Nyctanginaceae	*Boerhavia diffusa* L.	SUBMS/BOT-4715	Punarvana	Herb	Leaves	C, G, B	Extract, administered orally	Blood dysentery (16), swelling (21)	0.46
	Bougainvillea glabra Choisy	SUBMS/BOT-4716	Bouganbel	Shrub	Leaves	C, G	Extract, administered orally	Insect repellent (13), gastrointestinal infections (33)	0.58
Oleaceae	*Jasminum officinale* L.	SUBMS/BOT-4736	Chameli	Climber	Flowers	C, G, B	Oil, applied topically	Skin infection (14), wounds (16)	0.37
Oxalidaceae	*Oxalis dillenii* Jacq.	SUBMS/BOT-4745	Amrul	Herb	Leaves	C, G, B	Extract, administered orally	Eye disorders (39)	0.49
Phyllanthaceae	*Phyllanthus emblica* L.	SUBMS/BOT-4748	Amla	Tree	Leaves	G, C, B	Extract, applied topically	Wounds (54)	0.68
Poaceae	*Bambusa vulgaris* Schrad.	SUBMS/BOT-4713	Bans	Tree	Leaves, Rhizome	B	Paste, administered orally	Diarrhea (44)	0.55
	Cynodon dactylon (L.) Pers.	SUBMS/BOT-4727	Dhroob ghass	Grass	Whole plant	C, G, B	Administered orally	Increase milk production (36), stomach problems (23)	0.74

	Setaria viridis (L.) P.Beauv.	SUBMS/BOT-4755	Gajool ghass	Grass	Seeds	C, B, G	Administered orally	Livestock feed (45)	0.56
Pteridaceae	*Pteris longifolia* L.	SUBMS/BOT-4749	-	Fern	Leaves	B, C	Paste, applied topically	Wounds (8), broken bones (29)	0.46
Rosaceae	*Pyrus pashia* Buch.-Ham. ex D.Don	SUBMS/BOT-4693	Kainth	Tree	Stem	C, G	Extract, administered orally	Wound in eyes (53)	0.67
	Rubus ellipticus Sm.	SUBMS/BOT-4698	Hisalu	Shrub	Bark	B, C, G	Extract, administered orally	Injuries (39)	0.49
Rutaceae	*Aegle marmelos* (L.) Correa	SUBMS/BOT-4707	Bael	Tree	Fruits	C, G	Powder with mustard oil, applied topically	Burns (23), wounds (24)	0.59
	Citrus pseudolimonum Wester	SUBMS/BOT-4723	Glagal	Tree	Fruits	C, G	Extract, applied topically	Repellent against fleas, mosquitoes (32)	0.40
	Citrus sinensis (L.) Osbeck	SUBMS/BOT-4666	Malta	Tree	Fruit	G, C	Extract, applied topically	Wound healing (30)	0.37
	Murraya koenigii (L.) Spreng.	SUBMS/BOT-4743	Gandhal	Shrub	Leaves	C, G, B	Extract, administered orally	Skin infections (26), induce fertility in cattle (17)	0.54
Sapindaceae	*Acer negundo* L.	SUBMS/BOT-4646	Negundo	Tree	Leaves	C, B, G	Paste, applied topically	Wounds (27), eye disorders (9)	0.45
Urticaceae	*Boehmeria macrophylla* Hornem.	SUBMS/BOT-4655	Ramie	Shrub	Bark	C, G	Paste, applied topically	Bone fracture (28), giddiness (13)	0.51
Verbenaceae	*Verbena officinalis* L.	SUBMS/BOT-4766	Pitta maaree	Herb	Whole plant	C, B, G	Decoction, administered orally	Cure cold (51)	0.64
Zingiberaceae	*Curcuma longa* L.	SUBMS/BOT-4725	Haldi	Herb	Rhizome	B, G, S	Powder, applied topically	Wounds (31), skin infections (27)	0.73

B=Buffalo, G=Goat, S=Sheep, C=Cow, UV=Use value.

Regarding growth forms, herbs constituted the highest proportion (38%), followed by trees (35.2%) and shrubs (18.3%) (Fig. 3). The predominance of herbs is consistent with their wide distribution in agricultural fields and village surroundings, making them accessible for immediate use in treating livestock disorders.

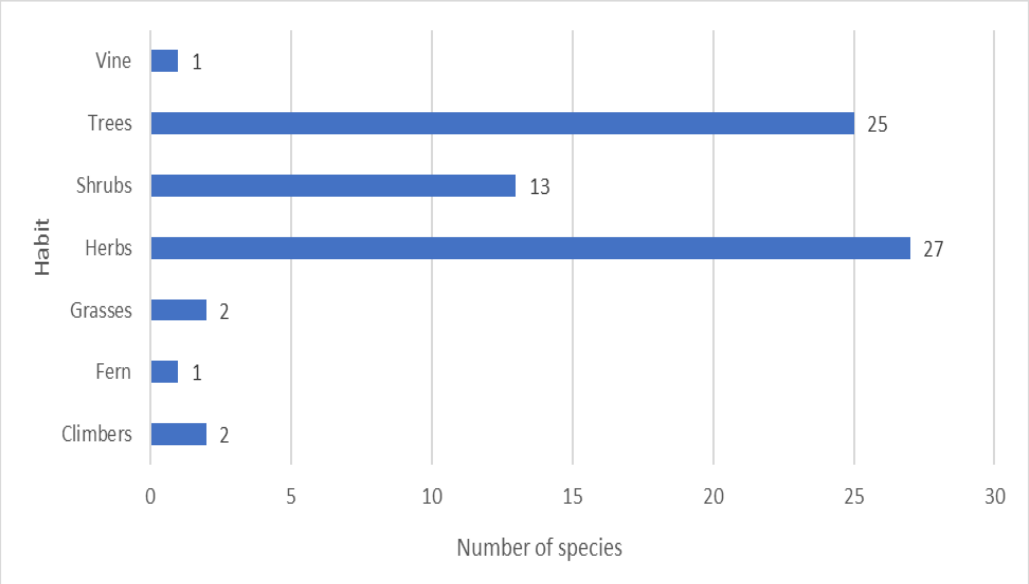

Figure 3. Growth forms of ethnoveterinary plant species documented in the study area.

Various plant parts were used in remedy preparation, including leaves, whole plant, bark, fruits, flowers, seeds, rhizomes, stems, and aerial parts (Fig. 4). Leaves were the most used frequently used plant part, reflecting both their availability and ease of processing.

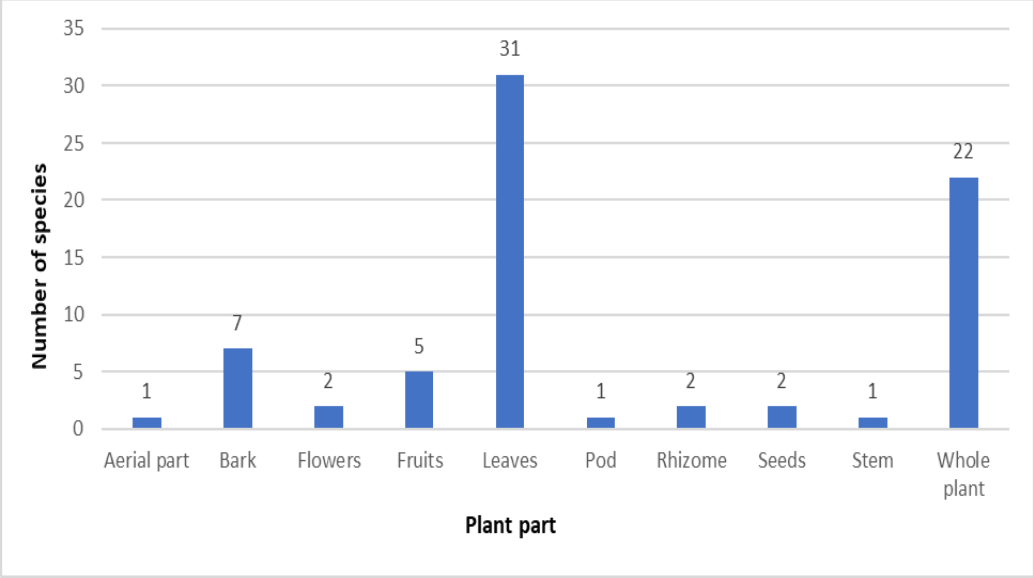

Figure 4. Plant parts used at study site.

Preparation methods varied across plant species. The most common forms of preparation include infusion, paste, decoction, extracts, dried powders, oils, and direct use of fresh plant material. In several cases, plant material was crushed or macerated before application. Modes of administration were classified as oral, topical, or combined application. Oral administration involved feeding plant material, while topical application included applying paste, oil or extract to the affected body part. In some instances, plant materials were combined with locally available additives such as salt, oil, or milk. Most of the documented plant species were collected from surrounding environment, making them readily accessible to households.

Use value

Several plant species showed relatively high UV, indicating frequent citations by informants. The highest UV were recorded for *Terminalia bellirica* (0.78), *Vitex negundo* (0.77), *Cynodon dactylon* (0.74), *Curcuma longa* (0.73), *Calotropis gigantea* (0.70), *Cuscuta reflexa* (0.70), and *Tagetes erecta* (0.70). Higher UV reflects greater citation frequency among informants with the study area. These species were mostly reported for the treatment of dermatological and gastrointestinal disorders in livestock.

Informant consensus factor

ICF values ranged from 0.94 to 0.98 across the major ailment categories, indicating a high level of agreement among the respondents about plant use for treating various diseases. The highest ICF value (0.98) was recorded for foot and mouth disease, which was treated using three commonly cited plant species with 133 use reports. ICF value was also observed for oral disorders (0.97), eye disorders (0.97), cold (0.98), gastrointestinal problems (0.96), parasitic infections (0.94), dermatological and related problems (0.95), gynecological, andrological and urogenital disorders (0.95), poisoning (0.94), and miscellaneous ailments (0.96) (Table 3). These high values indicate a relatively high level of agreement among informants regarding plant use within specific ailment categories.

Table 3. ICF for each livestock disease

Ailment categories	Nt	Nur	ICF
Oral disorders	2	35	0.97
Foot and mouth disease	3	133	0.98
Eye disorders	6	174	0.97
Parasitic diseases	7	120	0.94
Cold	2	78	0.98
Gynecological, andrological and urogenital	9	185	0.95
Dermatological and related problems	36	831	0.95
Gastrointestinal	23	651	0.96
Poisoning	2	20	0.94
Miscellaneous	19	483	0.96

Nt=Number of taxa, Nur=Number of reports

Fidelity level

In the present study, several species, including *Curcuma longa*, *Phyllanthus emblica*, *Bambusa vulgaris*, *Mentha arvensis*, *Dalbergia sissoo*, *Cuscuta reflexa*, *Ficus religiosa*, *Cannabis sativa*, *Trifolium sp.*, *Pyrus pashia*, and *Verbena officinalis*, showed FL values of 100% for specific ailments (Table 4). High FL values indicate strong agreement among informants regarding the specific use of these species for particular livestock ailments.

Table 4. FL of frequently reported ethnoveterinary plants and livestock diseases.

Botanical name	Ailment treated	FL%
Curcuma longa	Skin infections	100.0
Phyllanthus emblica	Wounds	100.0
Bambusa vulgaris	Diarrhea	100.0
Mentha arvensis	Dysentery	100.0
Dalbergia sissoo	Mouth infections	56.0
Cuscuta reflexa	Foot and mouth	100.0
Ficus religiosa	Placenta	100.0
Cannabis sativa	Worms	57.1
Trifolium sp.	Milk production	100.0
Pyrus pashia	Eye disorder	100.0
Verbena officinalis	Cold	100.0

Np=Number of plants, Nur=Number of reports

Discussion

The present study documents 71 plant species belonging to 40 families used in ethnoveterinary practices in Kangra region of Himachal Pradesh, highlighting the continued integration of plant knowledge within local livestock management systems. The predominance of plant species belonging to Fabaceae and Moraceae families reflects the patterns also reported in other

ethnoveterinary studies (Uprety *et al.* 2022, Bhat *et al.* 2023, Guleria *et al.* 2024). Herbs constituted the largest proportion of documented species, followed by trees and shrubs. The dominance of herbaceous species may be associated with their availability in agricultural fields, and surrounding areas. Similar patterns of herb dominance have been observed in study by Radha *et al*. (2019) and Radha *et al*. (2021), who also observed that herbs comprise a great percentage of medicinal plants in Himachal Pradesh. Leaves were the commonly used plant part. From an ecological point of view, leaf harvesting may exert comparatively lower ecological pressure than bark or root extraction (Van Andel & Havinga 2008, Mouillac *et al.* 2025). These findings highlight the importance of identifying sustainable harvesting techniques along with plant components, dosage standardization and prolonged control of resources (Tomeka *et al*. 2020). Preparation methods were relatively simple and relied on locally available materials. For example, plants were either used in form of decoction, paste, or directly fed to the animals. According to the informants, the use of such approaches reflects practical adaptation to rural conditions and limited access to modern facilities for livestock care (Tadesse *et al.* 2025) and are believed to enhance effectiveness of the remedy. Such preparation methods were also reported in earlier research done by Luseba & Tshisikhaw (2013), Eshetu *et al*. (2015), and Tariq *et al*. (2014). This implies that in most regions traditional knowledge and practices associated with animal healthcare is still in use and appreciated. It is, however, influenced by religion, culture, beliefs, and spiritual concerns of the people (Mathias 2005).

Moreover, the results showed that older informants have extensive knowledge as they reported a greater number of plant species and use-reported compared to younger participants. This pattern may reflect the experiential accumulation of knowledge through long-term involvement in livestock care and related socio-economic factors (Weckmüller *et al.* 2019, Mandal & Rahaman 2022). Quantitative indices provided further insight into patterns of plant use. Species with high FL values, such as *Curcuma longa*, *Phyllanthus emblica*, *Bambusa vulgaris*, *Mentha arvensis*, *Cuscuta reflexa*, *Ficus religiosa*, *Trifolium sp.*, *Pyrus pashia*, and *Verbena officinalis,* were cited frequently across informants, indicating broad cultural acceptance and understanding in treating certain diseases in livestock. From an ethnobotanical perspective, such indices identify culturally important plant species and prioritize species for further study or for conservation priority and provide insights into local ecological knowledge and traditional resource management practices (Reang *et al.* 2023). Although some documented species have been investigated in pharmacological studies (Ammon & Wahl 1991, Ahmed *et al*. 2006, Kaur *et al*. 2011, Siddiqui *et al*. 2015, Miraj & Kiani 2016, Thawkar *et al*. 2016, Fitri *et al*. 2020, Muhammad *et al*. 2020), the primary contribution of this research lies in documenting locally meaningful knowledge systems. Overall, the findings illustrate that ethnoveterinary knowledge in Kangra is closely linked to environmental availability, livestock management practices, and intergenerational transmission. Documenting such knowledge contributes to understanding how rural communities maintain animal health by utilizing the plant resources.

Conclusion

The present study documents ethnoveterinary plant knowledge practiced by rural communities of Kangra district in the Western Himalayas and highlights the continued role of plant-based remedies in local livestock healthcare systems. The findings demonstrate that ethnoveterinary practices remain closely connected to local ecological resources, livestock management strategies, and traditional knowledge transmission within rural communities. The use of diverse plant species and simple preparation techniques reflects practical adaptation to locally available resources and environmental conditions. Quantitative ethnobotanical indices further revealed patterns of cultural agreement and species prominence within the community, indicating the continued relevance of certain plants in traditional veterinary care. Beyond documenting plant uses, the study contributes to understanding how ethnoveterinary knowledge operates within socio-ecological systems where biodiversity, livelihoods, and cultural practices are interconnected. Such documentation is particularly important in mountain regions where traditional knowledge continues to support livestock management in areas with limited access to formal veterinary services. Future research may further explore sustainable harvesting practices, changing patterns of knowledge transmission, and the interaction between traditional and institutional animal healthcare systems. Recording and understanding these practices contributes to the preservation of local knowledge systems and provides a basis for interdisciplinary research on sustainable livestock management in Himalayan environments. Overall, the documentation of ethnoveterinary knowledge contributes to preserving biocultural heritage while improving understanding of traditional livestock healthcare practices in Himalayan socio-ecological landscapes.

Declarations

List of abbreviations: AMSL - Above Mean Sea Level; °C - Degree Celsius; UV - Use value; FL - Fidelity level; ICF - Informant consensus factor.

Ethics approval and consent to participate: The participation of informants was entirely voluntary and subject to their acceptance of free and informed consent. Verbal informed consent was obtained from all informants prior to their participation in the study. Institutional ethical approval was not required.
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