

Ethnoveterinary Plants used by Rural People of Bandli Wildlife Sanctuary District Mandi of Himachal Pradesh, India

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ABSTRACT: The present study was conducted in Bandli Wildlife Sanctuary, district Mandi, located in Himachal Pradesh, to collect and document the traditional ethnoveterinary knowledge utilized by the local communities. A total of 100 ethnoveterinary plants belonging to 88 genera and 52 families were recorded from the study area. Informants were selected through the snowball method, and the documentation involved direct interviews, group discussions, and questionnaires. A total of 97 informants were selected for traditional information. Most of the plant species reported from the study site belong to the Fabaceae family, followed by Moraceae and Euphorbiaceae families. Most plant species collected from the study area were trees (34), followed by herbs (31) and shrubs (19). Leaves were the most used plant part for ethnoveterinary practices. The most common livestock diseases reported from the study site were skin infections, digestive problems, eye infections, and foot and mouth diseases. The plant remedies were used in the form of paste, powder, and extract. During the present survey, it was noticed that older people have more diverse traditional knowledge of plants used for veterinary purposes compared to the younger generation. The main aim of the present survey was to collect and document the traditional ethnoveterinary knowledge from Bandli Wildlife Sanctuary, district Mandi, Himachal Pradesh.

Keywords : Ethnoveterinary, Traditional, Wildlife, Sanctuary and Knowledge.

INTRODUCTION

Ethnoveterinary medicine is a holistic interdisciplinary study of local knowledge, socio-cultural structures, and the environment associated with animal healthcare and husbandry (McCorkle, 1986). Traditional healing practices have been applied for centuries and passed down orally from generation to generation to keep animals healthy (Phondani *et al.*, 2010). According to the World Health Organization (WHO), approximately 80% of the world's population is directly dependent on plant resources for their health, especially those living in rural regions. The Indian Himalayan region, extending from Jammu and Kashmir in the North-West to Arunachal Pradesh in the East, covers approximately 419,873 km² area and is identified as one of the mega biodiversity hotspots, supporting many species of plants (Singh and Hajra 1996; Samant *et al.*, 1998). This region includes 1,748 medicinal plants, 675 wild edibles, 279 fodder species, 515 sacred plants, and 118 essential oil plants with medicinal values (Samant *et al.*, 1998; Samant and Palni 2000; Pant and Samant 2008). India is considered a rich source of biodiversity, with two mega biodiversity hotspots, the Western Ghats, and Eastern Himalayas (Tangjang *et al.*, 2011). It is one of the world's 12 mega-diversity countries, accounting for 8% of global plant generic resources and a higher share of microorganisms. India has 45,000 plant species, of

which 15,000-20,000 possess proven medicinal value. Since the Vedic era, plants have been used in veterinary treatment in India (Bhandari and Mukerji 1958). Himachal Pradesh, a hilly state in the Western Himalayas, covers an area of 55,673 sq. km with an altitude ranging from 350m to 7000m above mean sea level. The state comprises a good heritage of ethnobotanical flora and natural wealth, divided into three distinct regions: the Shivalik or outer Himalaya, mid-hills, and the greater Himalaya. Approximately 3,500 plant species have been recorded in Himachal Pradesh (Chauhan, 1999). Ethnobotanical work in the state has been conducted by various researchers (Brij Lal and Singh 2008; Kaur *et al.*, 2011; Sharma and Sood 2013; Kharwal *et al.*, 2014).

Himachal Pradesh is a rich source of herbal medicinal plants, and some communities are completely dependent on these plants for their well-being. Aromatic and medicinal plants are used for various therapeutic purposes, and different plant species have been used in India for medicinal purposes and human nourishment since Vedic times (Wani *et al.*, 2016). Wild plants are utilized for fulfilling daily human needs such as fuel, fodder, and medicines, and wild fruit-bearing plants contribute significantly to the economy of many communities worldwide (Maikhuri *et al.*, 1994). People acquire ethnoveterinary information through years of experience and orally pass it on from

generation to generation. However, with rapid cultural changes and modernization, traditional knowledge is being lost (Radha *et al.*, 2022). Therefore, there is an urgent need for scientific documentation of traditional information from rural areas of India. Ethnoveterinary traditional knowledge is crucial for the healthcare system of domestic animals (Gonzalez and Vallejo 2021). In Himachal Pradesh, rural people use ethnoveterinary medicines to cure their animals. Various studies have documented the use of medicinal plants for animal healthcare in different regions of the state, such as Kangra, Chamba, Kinnaur, Solan, Hamirpur, Shimla, among others. The Himalayan region is a storehouse of important plant species that can serve as a good substitute for medicinal purposes in curing livestock diseases in modern times. The study conducted in Bandli Wildlife Sanctuary, district Mandi, Himachal Pradesh aims to document and analyze traditional information associated with medicinal plants used in animal health problems by rural inhabitants.

MATERIALS AND METHODS

A. Description of Study Area

The present survey was conducted in Bandli Wildlife Sanctuary, district Mandi, Himachal Pradesh. Mandi district of Himachal Pradesh is situated in the western Himalayas. It is bounded by six districts and is almost in the centre of the state. To the northwest lies Kangra, to the west are Hamirpur and Bilaspur. Solan and Shimla districts are to the south, and Kullu is to the east. Bandli Wildlife Sanctuary is in the northern Indian state of Himachal Pradesh. It is known for its thick forest outgrowths which serve as excellent natural habitats for numerous wild animals. The sanctuary is situated about seven kilometres away from the town of Sunder Nagar, close to Mandi in Himachal Pradesh. It extends from 31°25'2" to 31°29'02" North and 76°52'04" to 76°56'54" East, covering an area of 41.32 square kilometers. Bandli Wildlife Sanctuary is characterized by hilly terrain spanning an altitudinal range from about 600 meters to over 2000 meters, with abrupt and steep changes in altitude. The highest point, Bandli Tibba, reaches an altitude of 2162 meters. The area consists of steep rocks and cliffs, with approximately 5% of the area covered by precipitous

rocky slopes. The approximate proportion of land use categories in Bandli Wildlife Sanctuary consists of 40% land under tree cover, while precipitous rocks comprise 15% and grasslands 5%. The annual rainfall in the area is around 1500 mm.

The southern, western, and northern sides of the sanctuary form part of the catchment of the Satluj River, while the eastern side drains into the Beas River through Bhadrolu Nala. The sanctuary is bounded on the southern side by Serikhad, and numerous nalas dissect the terrain of the sanctuary. The sanctuary has only one range, the Sunder Nagar range, which is further divided into four beats: Maloh, Saul, Bobar, and Khural. An additional beat, Trambri, is part of the forest training school. The sanctuary experiences distinct seasons, including cold, dry, and wet seasons, with temperature variations ranging from 36°C in summer to as low as -1°C in winter. Ground frost is common during winter, and mild fog conditions persist for a short duration during the monsoon season. Wind conditions remain mild for most of the year, with high-velocity winds occurring only on hilltops. Bandli Wildlife Sanctuary contains a rich forest cover comprising three forest types: northern dry mixed deciduous forests, Himalayan subtropical chir pine forests, and lower West Himalayan temperate forests (Ban Oak Forest). Some of the major species characterizing this forest type in the sanctuary include *Acacia catechu*, *Acacia fistula*, *Embllica officinalis*, *Dalbergia sissoo*, *Syzygium cumini*, *Mallotus philippinensis*, etc. The sanctuary area also comprises patches of grassland dotted with Phoenix trees. This protected area is rich in plant diversity due to vast altitudinal variation and geographical conditions. Bandli was a reserve forest until 1962, and after the enactment of the Wildlife Protection Act in 1972, the final notification designating it as a wildlife sanctuary took place in 1974. Agriculture and farming are the primary occupations of the rural inhabitants of Bandli. Maize, green vegetables, and potatoes are the main cultivation crops grown in the area. Livestock such as sheep, goats, cows, and buffaloes are popular among rural people and provide meat, milk, and milk products for the people of Sunder Nagar town.



Fig. 1. Map of study site.

B. Sampling informants

During the survey, a total of 97 informants (67 males and 30 females) were randomly selected for interviews. The age and educational background were also recorded during the interviews. The informants were

divided into 5 groups based on their age (Table 1). In this study, it was observed that older people have vast knowledge of ethnoveterinary medicinal plants compared to the younger generation.

Table 1: Demography and literacy among informants.

Sr. No.	Age groups	No. of informants (Males)			No. of informants (Females)	
1.	25-34	04(5.97%)			02(6.66%)	
2.	35-44	08(11.94%)			03(10%)	
3.	45-54	13(19.40%)			05(16.66%)	
4.	55-64	15(22.38%)			08(26.66%)	
5.	65-74	27(40.29%)			12(40%)	
	Total Informants : 97	Males -67 (69.07%)			Females – 30 (30.92%)	
Literacy among informants:		(Age groups)				
		25-34	35-44	45-54	55-64	64-75
1.	Never attended school	0	0	05	07	13
2.	Attended school up to primary level (1-5 class)	0	0	07	10	15
3.	Attended school up to middle level (6-8 class)	0	04	05	06	05
4.	Attended school up to metric level(9-10 class)	09	06	03	02	0

C. Ethnoveterinary data collection and ethical consideration

The ethnoveterinary data were collected from rural areas of Bandli Wildlife Sanctuary in district Mandi, Himachal Pradesh, India. A total of 97 male and female informants were selected by snowball methods for interviews. The ethnoveterinary data were collected through questionnaires, observations, interviews, and participatory observations (Jain, 1986). Extensive field visits were used to collect ethnoveterinary data from unexplored rural areas of Bandli in tehsil Sunder Nagar of Mandi district, Himachal Pradesh, India. For the ethnoveterinary survey, the questionnaire was divided into three sections: demographic data, ethnoveterinary plant uses, and informant’s declaration. The ethnoveterinary plant species were collected from Bandli between July 2021 and July 2022, and they were identified by the Botanical Survey of India, Nauni Solan, H.P. The identified plant specimens with voucher numbers were submitted to the herbarium of Shoolini University, Solan, Himachal Pradesh, India.

D. Questionnaire for conducting ethnoveterinary study.

(A) Demographic data:

- 1.Name of Tehsil.....
2. Name of Village.....
- 3.Age.....
- 4.Education.....

(B) Ethnoveterinary medicinal plant uses:

- 1.Plant (Local/Vernacular name)
- 2.Plant identified as.....(Botanical name)
- 3.Habit of plant (Trees/Shrubs/Herbs/Climbers/Grasses/Other)
- 4.Parts of plant used
- 5.Nature of ailment treated
- 6.Mode of administration (a)Oral (b)Tropical)

I Informant’s declaration

I, the above mentioned, have voluntarily agreed to participate in the study with my full consent, and I

declare that the information and knowledge given in interview and discussion is correct.

Signature

Dated:

E. Data analysis

Ethnoveterinary medicine data were collected from a randomly selected sample of 97 informants in the study area. The collected data were then analyzed using the “use value” method, which quantitatively assesses the relative importance of each species based on the number of citations per species provided by the informants.

F. Use Value of Ethnoveterinary Medicinal Plants

The analysis of ethnoveterinary medicines data obtained from 97 informants was done statistically using the “use value” (UV), which is a quantitative approach for demonstrating the relative importance of a particular species known to folks. It was calculated using the formula (Phillips & Gentry 1993):

$$UV = \sum U_i/n$$

Where:

UV is the use value of a species.

U_i is the number of citations per species.

N is the number of informants. A high percentage of use value indicates the importance of that plant species, while a lower percentage refers to that plant species being relatively less used.

RESULTS

A. Ethnoveterinary Plants reported by the Informants

The rural inhabitants of the study area were found to be utilizing 100 plant species from 88 genera belonging to 52 families for ethnoveterinary purposes. It was observed that the Fabaceae, Moraceae, and Euphorbiaceae families were the most reported. The Fabaceae family had 8 plant species, followed by the Moraceae and Euphorbiaceae families, each with 7 plant species. Solanaceae and Asteraceae contributed 6

plant species each, while the Lamiaceae family had 4 plants. Additionally, the Meliaceae, Verbenaceae, and Zingiberaceae families contributed 3 plant species each. Other families such as Acanthaceae, Anacardiaceae, Liliaceae, Lythraceae, Menispermaceae, Poaceae, Pinaceae, Pteridaceae, Rosaceae, Rutaceae, Ranunculaceae, and others contributed 2 plant species each. Furthermore, Apocynaceae, Adiantaceae, Araceae, Apiaceae, Berberidaceae, Bombacaceae, Crassulaceae, Cannabaceae, Chenopodiaceae, Convolvulaceae, Cyperaceae, Commelinaceae, Combretaceae, Equisetaceae, and other families contributed 1 plant species each. Different species of family Asteraceae (8), Lamiaceae (7), Apiaceae (4) were employed in ethnoveterinary practice in Chamba district of Himachal Pradesh reported by (Thakur *et al.*, 2016). There are examples of similar documentation of Thakur *et al.* (2016); Sharma *et al.* (2012); Farouji and Khodavari (2016) which reported that leaves were the most frequently used plant parts in treatment of various animal diseases. Similar results were observed in findings of (Lulekal *et al.*, 2011) which reported that 44 species were used in powder form, 17 species in decoction form, 14 species as paste, 4 species as extraction and 1 species through inhalation.

A total of 97 informants (67 males and 30 females) were randomly selected for interviews and data collection. Numerous plant species found in the study area are utilized as ethnoveterinary medicines, with 34 trees, 31 herbs, 24 shrubs, 9 climbers, and 2 grasses recorded.

It was observed in this study that leaves were the most used plant part (Thakur *et al.*, 2021) followed by whole aerial parts, fruits, and flowers. These plant parts were often used in the form of paste, juice, and powder. According to the informants, the mode of use can vary from oral to topical applications. Maximum species were used to cure gastrointestinal problem, which is following earlier works in cold desert region as reported by Sood *et al.* (2001); Basant and Chaurasia (2009).

The most frequently reported livestock diseases included foot and mouth disease, fever, cold and cough, bahan, mouth ulcer, reduction in milk, thanela, hardness of neck, and placental problems after delivery.

The 100 plant species recorded from the study area were highly recommended by the informants for treating diseases found in animals. These plants are systematically arranged with their botanical names, families, common names, plant parts used as ethnoveterinary medicines, and modes of use described (Table 2).

B. Use Value of Ethnoveterinary Medicinal Plants

The use value was calculated using the formula $UV = \sum U_i/n$, where U_i represents the number of uses cited by informants for a specific plant species, and n is the total number of informants. The highest use values were found in *Grewia oppositifolia* (0.85), *Solanum nigrum* (0.52), *Terminalia chebula* (0.45), *Pistacia integerrima* (0.43), and *Zanthoxylum armatum* (0.41).

Various plant parts such as roots, leaves, stems, flowers, tubers, seeds, rhizomes, and bark are utilized to treat a variety of livestock diseases. A total of 100 plants were documented for ethnoveterinary preparations in adjoining rural areas of Bandli Wildlife Sanctuary. During discussions with rural inhabitants, common ailments in livestock such as foot and mouth disease, skin infections, diarrhea, constipation, insect bites, wounds, and cuts were reported. The most popular methods of preparation include the use of leaf paste, seed powder, fruit juice, and wood ash. According to data collected from informants, it was found that the mode of administration can be oral or topical, and certain plants can be used both orally and topically to treat livestock diseases. Most preparations involve the use of a single plant, with only a few combining multiple plant species. Table 2 provides a detailed list of all plants reported, including their botanical names, families, habits, parts used, and ailments treated.

Table 2: Ethnoveterinary medicinal plants used in study area.

Sr. No.	Botanical name	Family	Common name	Disease treated	Habit	Parts used	Mode of application	Ethnoveterinary medicinal uses	Use-value
1.	<i>Acacia catechu</i> (L. f.) Willd.	Fabaceae	Khair	Foot and mouth disease	Tree	Bark	Topical	Bark is used to treat foot and mouth disease	0.03
2	<i>Acacia nilotica</i> Benth.	Fabaceae	Kikar	Fever	Tree	Roots	Oral	Root is used in the form of powder with water	0.05
3	<i>Achyranthes aspera</i> Linn.	Amaranthaceae	Puthkanda	Insect bite	Herb	Whole plant	Topical	Paste of whole plant is applied on effected parts	0.10
4.	<i>Adhatoda vasica</i> Nees	Acanthaceae	Basuti	Joint pain	Shrub	Leaves	Topical	Leaf paste is used with mustard oil	0.06
5.	<i>Azadiracta indica</i> A. Juss	Meliaceae	Neem	Skin problems	Tree	Leaves	Topical	Leaves are directly rubbed on skin	0.12
6.	<i>Ageratum conyzoides</i> L.	Asteraceae	Neela phul	Dog bite	Herb	Whole plant	Topical	After washing the bite parts whole plant juice is applied	0.20
7.	<i>Agave cantala</i> L.	Agavaceae	Ramban	Wound	Shrub	Leaves	Topical	Leaves paste is applied on wound part	0.06

8.	<i>Aegle marmelos</i> Webb.& Benth.	Rutaceae	Bael	Fever	Tree	Fruits	Oral	Fruit juice is given orally two times daily till further recovery	0.21
9.	<i>Ajuga bracteosa</i> Wall. ex . Benth.	Asteraceae	Neelkanthi	Foot and mouth disease	Herb	Whole plant	Oral	Whole plant is crushed and mixed with flour and given orally	0.07
10.	<i>Albizia lebbek</i> Benth.	Fabaceae	Chule	Eye whiteness	Tree	Leaves	Topical	2-3 drops of leaves juice are used 2-3 times daily	0.23
11.	<i>Aloe vera</i> (L.)Burm.f.	Liliaceae	Dware	Stomach problem	Herb	Whole plant	Oral	Whole plant is given to the animal daily in empty stomach	0.06
12.	<i>Artemisia vulgaris</i> L.	Asteraceae	Chharmra	Digestive problems	Shrub	Leaves	Oral	Leaves are given daily in morning in empty stomach	0.04
13.	<i>Asparagus racemosus</i> Wild	Liliaceae	Sansarpali	Reduction in milk	Shrub	Roots	Oral	Roots are given with fodder to increase the milk production	0.07
14.	<i>Bambusa arundinacea</i> (Retz.) Roxb.	Poaceae	Bainjh	Cough	Grass	Leaves	Oral	Leaves are given orally	0.12
15.	<i>Bauhinia vahlii</i> Wight	Fabaceae	Taur	Cold and cough	Climber	Leaves	Oral	Leaves are used to cure cold and cough	0.20
16.	<i>Bauhinia variegata</i> L.	Fabaceae	Karyale	Reproductive problems	Tree	Tree	Oral	Leaves act as cooling agent and given orally to ensure successful pregnancy in cow and buffalo	0.23
17.	<i>Berberis asiatica</i> Roxb.ex DC.	Berberidaceae	Kashmale	Fever	Shrub	Roots	Oral	Roots are given orally to treat fever	0.06
18.	<i>Bombax ceiba</i> L.	Bombaceae	Simbal	Thanela	Tree	Bark	Oral	Bark powder is mixed with feed which increases the flow of blocked milk	0.04
19.	<i>Bryophyllum pinnata</i> (Lam.)Oken.	Crassulaceae	Patherchat	Joint pain	Herb	Leaves	Topical	Leaf of plant dipped in mustard oil slightly heated on flame and applied on the body part	0.06
20.	<i>Calotropis procera</i> R.Br.	Asclepiadaceae	Aak	Hardness of neck	Herb	Leaves	Topical	Leaves with deshi ghee applied as massage on neck	0.02
21.	<i>Cassia fistula</i> L.	Fabaceae	Amaltas	Ban	Tree	Fruits	Oral	fruits are boiled with water till 1/3 left and jaggery is added and given orally	0.11
22.	<i>Cassia tora</i> L.	Fabaceae	Allown	Dog bite	Shrub	Seeds	Oral	Seeds powder is mixed with 1-2 litres of lassi and given orally	0.06
23.	<i>Cedrus deodara</i> (Roxb.) Locid	Pinaceae	Kewli	Skin problems	Tree	Whole plant	Topical	Tar obtained is applied on skin	0.13
24.	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	Insect bite	Herb	Leaves	Topical	Massage with crushed leaves	0.22
25.	<i>Carissa opaca</i> Stapf. Ex.Haines.	Apocynaceae	Kharnu	Digestive problems	Shrub	Leaves	Oral	Leaves are given orally to treat digestive problems	0.05
26.	<i>Centella asiatica</i> L.	Apiaceae	Brahmi	Pregnancy problems after conception	Herb	Whole plant	Oral	Whole plant is used to retain pregnancy after	0.34

								conception for 3-4 days	
27.	<i>Cheilanthes abomarginata</i> C. B. Clarke	Adiantaceae	Silver Fern	Wounds	Herb	Whole plant	Tropical	Paste of aerial parts is applied on the wounds	0.07
28.	<i>Chenopodium album</i> L.	Chenopodiaceae	Bithu	Reduction in milk	Herb	Whole plant	Oral	Whole plant is used as fodder for milk enhancement	0.05
29.	<i>Cissampelos pareira</i> L.	Menispermaceae	Patindu	Loose motion	Climber	Leaves	Oral	Leaves boiled in 4-5 litres of water till ¼ left and 200-250 ml given orally twice daily for 5-7 days	0.23
30.	<i>Colocasia esculenta</i> L. (Schott.)	Araceae	Jangli Kachaloo	Digestive problems	Herb	Tubers	Oral	Tubers are used to treat digestive problems	0.12
31.	<i>Commelina benghalensis</i> L.	Commelinaceae	Chhura	Eye redness	Herb	Whole plant	Topical	Juice of aerial parts is used	0.06
32.	<i>Cirsium wallichii</i> DC.	Asteraceae	Kantili	Fever	Herb	Leaves	Oral	Juice of leaves is used to cure fever	0.03
33.	<i>Curcuma aromatica</i> Salisb	Zingiberaceae	Ban haldi	Miscarriage	Herb	Rhizome	Oral	Rhizome pieces mixed with feed is used	0.06
34.	<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Akash bail	Fracture	Climber	Whole part	Tropical	Whole plant in the form of paste is used	0.34
35.	<i>Cynodon dactylon</i> L. Cers.	Poaceae	Dhruv	Urination problems	Grass	Whole plant	Oral	Whole plant juice is given orally twice a day	0.24
36.	<i>Cestrum nocturnum</i> L.	Solanaceae	Rat ki rani	Digestive problems	Shrub	Leaves	Oral	Leaves are used as a fodder to treat digestive problems	0.13
37.	<i>Cyperus rotundus</i> (L.)	Cyperaceae	Morla	Fever	Grass	Tubers	Oral	Tubers boiled with water is given two times a week	0.04
38.	<i>Continus cogygria</i> Scop.	Anacardiaceae	Thira	Eye problems	Tree	Leaves	Tropical	Juice of leaves is used to treat eye problems	0.02
39.	<i>Dalbergia sissoo</i> L.f.	Fabaceae	Shisham	Blood in urine	Tree	Leaves	Oral	Leaves are used as fodder to cure blood in urine	0.05
40.	<i>Datura stramonium</i> L.	Solanaceae	Dhatura	Skin diseases	Shrub	Flowers	Tropical	Crushed flowers are used to treat skin problems	0.05
41.	<i>Dioscorea bulbifera</i> Russ. Ex. Wall.	Discoreaceae	Tardi	Dysentery	Climber	Tubers	Oral	Pieces of tubers are used to treat dysentery	0.07
42.	<i>Duranta repens</i> L.	Verbenaceae	Duranta	Skin itches	Shrub	Leaves	Tropical	Leaves are used to treat skin itches	0.13
43.	<i>Emblica officinalis</i> Gaertn	Euphorbiaceae	Ambla	Digestive problems	Tree	Fruits	Oral	Fruits are given to treat digestive problems	0.15
44.	<i>Equisetum debile</i> Roxb. ex Vauch.	Equisetaceae	Gornal	Evagination of uterus	Shrub	Whole plant	Oral	Whole plant is crushed mixed in wheat flour and given orally two times daily for a week	0.02
45.	<i>Eriobotrya japonica</i> (Thunb)	Rosaceae	Loquat	Indigestion	Tree	Fruits	Oral	Fruits are used to cure indigestion	0.05
46.	<i>Ergeron annus</i> L.	Asteraceae	Phuntha	Skin problems	Herb	Flowers	Tropical	Crushed flowers are applied on skin	0.01
47.	<i>Eucalyptus globulus</i> Labill.	Myrtaceae	Safeda	Cold and cough	Tree	Bark	Oral	Bark is used to treat cold and cough	0.05
48.	<i>Euphorbia hirta</i> L.	Euphobiaceae	Dudhali	Respiratory problems	Herb	Leaves	Oral	Leaves given to cure respiratory problems	0.03

48.	<i>Euphorbia heterophylla</i> L.	Euphorbiaceae	Bari dudhali	Snake bite	Herb	Leaves	Topical	Crushed leaves are applied on bite part	0.04
49.	<i>Euphorbia royleana</i> Boiss.	Euphorbiaceae	Chhun	Reduced ovulation	Shrub	Stem	Oral	It stimulates ovulation in animals	0.03
50.	<i>Ficus benghalensis</i> L.	Moraceae	Bargad	Abortion	Tree	Leaves	Oral	Leaves are mixed with fodder to retain pregnancy in buffalos	0.05
51.	<i>Ficus carica</i> L.	Moraceae	Fegra	Skin problems	Tree	Leaves	Topical	Leaves paste is applied on skin	0.05
52.	<i>Ficus auriculata</i> Lour.	Moraceae	Trambal	Digestive problems	Tree	Fruits	Oral	Fruits are used to cure digestive problems	0.01
53.	<i>Ficus palmata</i> Forssk	Moraceae	Panjpatra	Swelling in mouth and neck	Tree	Leaves	Topical	Paste of leaves is applied on body parts	0.02
54.	<i>Ficus religiosa</i> L.	Moraceae	Peepal	Digestive problems	Tree	Leaves	Oral	Leaves cure digestive problems	0.06
55.	<i>Fragaria vesca</i> L.	Rosaceae	Wild strawberry	Digestive problems	Herb	Fruits	Oral	Fruits are used to cure digestive problems	0.06
56.	<i>Grewia oppositifolia</i> Roxb.	Malvaceae	Beul	Fever	Tree	Leaves	Oral	Leaves are fed as fodder	0.85
57.	<i>Hedychium coronarium</i> J.Koenig	Zingiberaceae	Shati	Fever	Herb	Rhizome	Oral	Paste of rhizome given with feed	0.07
58.	<i>Hevea brasiliensis</i> Wild.	Euphorbiaceae	Rubber	Skin problems	Tree	Whole plant	Topical	Milky juice is applied on skin	0.03
59.	<i>Jasminum humile</i> B. Heyne ex. Wall.	Oleaceae	Peeli chameli	Skin problems	Climber	Leaves	Oral	Leaves are used to treat skin problems in animals	0.06
60.	<i>Juglans regia</i> L. Var.	Juglandiaceae	Khor	Leaves	Tree	Leaves	Oral	Leaves given as fodder to cure digestive problems	0.12
61.	<i>Lantana camara</i> L.	Verbenaceae	Lal sage	Fever	Shrub	Whole plant	Oral	Juice of whole aerial plant parts is used	0.02
62.	<i>Mentha longifolia</i> L.	Lamiaceae	Pudina	Indigestion	Herb	Leaves	Oral	Leaves are used to treat indigestion	0.04
63.	<i>Mentha piperita</i> L.	Lamiaceae	Pipermint	Indigestion	Herb	Leaves	Oral	Leaves are used to cure indigestion	0.01
64.	<i>Melia azadirachta</i> L.	Meliaceae	Darek	Wounds	Tree	Leaves	Oral	Crushed leaves are applied on wounds	0.05
65.	<i>Mallotus philippinensis</i> (Lam.)Muell.Arg.	Euphorbiaceae	Kambal	Reduced milk	Tree	Leaves	Oral	Leaves are given to increase milk	0.07
66.	<i>Morus rubra</i> L.	Moraceae	Safed chimmmbu	Kidney problems	Tree	Leaves	Oral	Juice of leaves is given to treat kidney problems	0.04
67.	<i>Morus nigra</i> L.	Moraceae	Kalachimmmbu	Cough and cold	Tree	Leaves	Oral	Leaves are given as fodder to treat cough and cold	0.03
68.	<i>Murray koenigii</i> (L.)	Rutaceae	Gandhelu	Dysentery	Shrub	Leaves	Oral	Leaves are used to cure dysentery	0.02
69.	<i>Ocimum basilicum</i> L.	Lamiaceae	Bhabri	Loose motion	Herb	Seeds	Oral	Seeds are soaked in water and then given to the animal	0.04
70.	<i>Oxalis corniculata</i> L.	Oxalidaceae	Khat malori	Stomachache	Herb	Leaves	Oral	Leaves are used to treat stomachache	0.02
71.	<i>Phyllanthus niruri</i> Linn.	Phyllanthaceae	Bhumi ambla	Cough and cold	Herb	Whole plant	Oral	It' juice is used to treat t cough and cold	0.34
72.	<i>Pinus roxburghii</i> Sarg.	Pinaceae	Chir	Skin problems	Tree	Stem	Topical	Resin obtained is used externally for the treatment of skin problems	0.05

73.	<i>Pistacia integerrima</i> Stew.ex Brand.	Anarcadiaceae	Kakarsingi	Wounds and cuts	Tree	Leaves	Topical	Leaves have wound healing properties and are applied on wounds	0.43
74.	<i>Pteris vittata</i> L.	Pteridaceae	Sangah	Wounds	Herb	Leaves	Topical	Juice of leaves is used for wound healing	0.03
75.	<i>Punica granatum</i> L.	Lythraceae	Daru	Cough and cold	Shrub	Bark	Oral	Dried bark is grounded and its powder is mixed with feed and is used	0.05
76.	<i>Quercus leucotrichophora</i> A.Camous	Fragaceae	Ban	Fever	Tree	Leaves	Oral	Leaves are used as fodder to treat fever	0.06
77.	<i>Ranunculus sceleratus</i> Linn.	Ranunculaceae	Jal dhania	Skin problems	Herb	Leaves	Topical	Crushed leaves are applied on skin	0.06
78.	<i>Ricinus communis</i> L.	Euphorbiaceae	Arand	Placenta expulsion problems	Shrub	Fruits	Oral	Fruits are used for placenta expulsion problems after delivery	0.06
79.	<i>Rhododendron arboreum</i> Sm.	Ericaceae	Burans	Dysentery	Tree	Flowers	Oral	Flowers are used to cure dysentery	0.06
80.	<i>Rubus ellipticus</i> Sm.	Rosaceae	Akhe	Fever	Shrub	Fruits	Oral	Fruits are used in fever	0.07
81.	<i>Rubia cordifolia</i> L.	Rubiaceae	Majishtha	Wounds	Climber	Leaves	Topical	Powder of dried leaves is mixed with honey is applied on wounds	0.03
82.	<i>Rumex hastatus</i> D.don.	Poligenaceae	Ambi	Constipations	Shrub	Leaves	Oral	Leaves are used to treat bahan	0.06
83.	<i>Salix alba</i> L.	Salicaceae	Beunce	Fever	Tree	Leave	Oral	Leaves are used to cure fever	0.03
84.	<i>Sapindus mukorossi</i> Gaertn.	Sapinadaceae	Doda	Lices on skin	Tree	Fruits	Topical	Fruit pulp is used for the treatment of lices on skin	0.30
85.	<i>Solanum nigrum</i> L.	Solanaceae	Mako	Pneumonia	Herb	Whole plant	Oral	Whole aerial plant parts are used to treat pneumonia	0.52
86.	<i>Solanum surattense</i> Burm.f.	Solanaceae	Kantkari	Cough	Herb	Fruits	Oral	Fruits are used to treat cough	0.07
87.	<i>Stephania glabra</i> Roxb.	Menispermaceae	Bishkhaber	Mouth ulcer	Climber	Tubers	Oral	Tuber pieces are given with feed to treat mouth ulcer	0.07
88.	<i>Tectona grandis</i> Linn.	Lamiaceae	Teak	Respiratory problems	Tree	Flowers	Oral	Dry flowers are used to treat respiratory problems	0.05
89.	<i>Terminalia chebula</i> Retz.	Combretaceae	Harde	Cough	Tree	Fruits	Oral	Dried powder of fruits is used in cough	0.45
90.	<i>Thalictrum foliosum</i> DC.	Ranunculaceae	Kathu	Digestive problems	Herb	Leaves	Oral	Fresh leaves as fodder	0.05
91.	<i>Tinospora cordifolia</i> Willd. Miers	Menispermaceae	Giloe	Fever	Climber	Stem	Oral	It increases immunity and is used for the treatment of fever	0.08
92.	<i>Toona ciliata</i> M.Roem.	Meliaceae	Tuni	Fever	Tree	Bark	Oral	Bark is used to treat fever	0.12
93.	<i>Urtica dioica</i> L.	Urticaceae	Koogas	Fever	Shrub	Leaves	Oral	Dried leaves are grounded and mixed with feed to treat fever	0.05
94.	<i>Vernonia anthelmintica</i> Wild.	Asteraceae	Brahmjiri	Bsaiher	Herb	Leaves	Oral	Crushed leaves with wheat flour as Ladoo are used	0.12
95.	<i>Violaserpens</i> Wall.	Violaceae	Banakasha	Cough and cold	Herb	Flowers	Oral	Flowers are boiled with water is used	0.06

96.	<i>Vitis flexusa</i> Thumb	Vitaceae	Jangli angoor	Cough	Climber	Fruits	Oral	Dried fruits are used to cure cough	0.08
97.	<i>Vitex negundo</i> L.	Verbenaceae	Bahna	Respiratory problems	Shrub	Leaves	Oral	Leaves are used to cure respiratory problems	0.07
98.	<i>Withania somnifera</i> L	Solanaceae	Ashwagandha	Inflammations	Shrub	Leaves	Topical	Paste of leaves is applied on inflammations	0.06
99.	<i>Ziziphus mauritiana</i> Lam.	Zingiberaceae	Beriydi	Skin problems	Shrub	Leaves	Topical	Paste of leaves is applied on skin	0.06
100.	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Tirmere	Fever	Shrub	Fruits	Oral	Fruit juice is used to cure fever	0.41

DISCUSSION

Plants are the most used ingredients in the preparation of ethnoveterinary medicines. All parts of the plants, including leaves, bark, fruits, flowers, roots, and seeds, are used in medicinal preparations. Plants play a vital role in human health, with at least 80% of people in developing countries relying largely on indigenous practices for the control and treatment of various diseases affecting both humans and their animals, according to the World Health Organization. These traditional healing practices are referred to as "Ethnoveterinary medicine," which is cost-effective and dynamic (Warren, 1991). Rural inhabitants have developed extensive knowledge in utilizing plants as food and medicine based on their cultural practices. They have a long history of using plants for ethnoveterinary medicine. The present study documented different types of diseases in animals, such as curing colds, coughs, fevers, diarrhea, skin infections, retained placenta, bone fractures, wounds, mouth ulcers, and foot and mouth disease. Preparations and modes of administration vary with the type of disease, with leaves being commonly used in most cases. Detailed information was recorded for 100 plant species. me common ailments like expulsion of

Among these ethnoveterinary medicinal plants, species from the Fabaceae, Moraceae, and Euphorbiaceae families were most used. Plants from these families have been traditionally used to treat various diseases in animals. In terms of habit, trees dominated their medicinal uses, followed by herbs, shrubs, climbers, and grasses, respectively. Leaves were most frequently used against different ailments, followed by whole aerial parts, fruits, flowers, tubers, bark, stems, and seeds. These ethnoveterinary medicinal plants are used by rural inhabitants against many ailments. Sometimes, to increase effectiveness, two or more plant species are used in combination (refer to Table 2). The main aim of this study is to explore and document traditional ethnoveterinary medicinal plant knowledge.

CONCLUSIONS

The traditional knowledge regarding the use of ethnoveterinary medicinal plants is typically passed down orally from one generation to the next without proper documentation or written records, a practice observed worldwide. Unfortunately, this valuable

traditional knowledge on the healing properties of plants is gradually diminishing over time. The current study was conducted in Bandli Wildlife Sanctuary, located in the Sunder Nagar tehsil of Mandi district, Himachal Pradesh. The rural inhabitants of the study area rely on ethnoveterinary medicinal plants to treat diseases in their livestock due to their easy availability, affordability, and minimal or no side effects. This study aims to document the ethnoveterinary medicinal plants, providing a valuable database for future research studies. Trees, herbs, and shrubs were identified as the most used ethnoveterinary medicinal plants by rural inhabitants. Notably, this study marks the first documentation of ethnoveterinary medicinal plants from Bandli Wildlife Sanctuary. The rural inhabitants reported using these plants both internally and externally for treatment purposes. However, they expressed concern over the declining interest of the new generation in traditional knowledge. Therefore, it is imperative to urgently document the ethnoveterinary medicinal plants used by rural inhabitants in Bandli Wildlife Sanctuary, Mandi district, Himachal Pradesh.

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Conflicts of Interest. None.

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