

ISSN: 2220-4822

# Ethnoveterinary studies of medicinal plants used to treat livestock in the Haridwar region of Uttarakhand, India

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## ABSTRACT

Ethnoveterinary practices are still prevalent in rural livestock healthcare. This research contributes significantly to the understanding of biological resources employed in ethnoveterinary practices in the Haridwar district of Uttarakhand. This current study focuses on ethnoveterinary knowledge among ethnic populations in Haridwar and quantitatively documented the traditional knowledge about the usage of different medicinal herbs. The field survey was carried out at four sampling sites, *i.e.*, Chilla range, Mohand range, Vindhyavasini hills, and Shyampur range. The ethnoveterinary information was documented and collected in the study areas through interviews, questionnaires, and group discussions with ethnic communities and traditional healers, primarily elderly shepherds and farmers. The collected data were quantitatively analysed utilizing the informant consensus factor (ICF), fidelity level (FL), and use value (UV). In this study, 102 medicinal plant species were identified in which herbs (58.8%) were the maximum used life forms. Leaves (27.1%) were found to be the most commonly used plant part. The oral mode of medication was used most often in the ethnoveterinary practices (79.4%) used. Quantitative analysis revealed that the most important species having high UV values for curing livestock was *Zingiber officinale* (L) (UV = 2.67). FL% values ranged between 27.8 to 100% and ICF values ranged from 0.97 to 0.99. This study reveals that a large variety of medicinal plant species are of great ethnoveterinary relevance and are used by informants in Haridwar to treat cattle ailments. Further phytochemical and pharmacological studies would be needed to determine the usefulness and safety of the identified plants, allowing communities to use them in a more cost-effective, and safe manner.

Received: August 05, 2021

Revised: August 08, 2022

Accepted: August 22, 2022

Published: September 03, 2022

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**KEYWORDS:** Ethnoveterinary, Medicinal plants, Traditional knowledge, Livestock, Herbal practitioners.

## INTRODUCTION

Medicinal plants are widely used for biodiversity conservation and research (Kumari *et al.*, 2022). Ethnobotanical studies play an important role in uncovering the history of plant uses and their relationships with humans. To heal various diseases, tribal people around the world use natural or traditional herbal treatments, and around 25 percent of medicines are derived from plants (Radha *et al.*, 2022). Approximately 65–80 percent of the world's population takes herbal remedies prepared from medicinal plants, according to the WHO (World Health Organization, 2011). The relevance of traditional knowledge in understanding the dynamic relationship between biodiversity and socio-cultural structures can't be overstated (Pandey & Tripathi, 2017). Folk-veterinary medicine refers to traditional knowledge, skills, and practices relating to animal health, which play an important role in rural areas as a primary source of medicine for dealing with animal

health problems (Sharma *et al.*, 2021). A traditional herbal medicine system and ethnoveterinary health care system were passed from generation to generation in the Shivalik range, and they are effective in treating livestock illnesses (Sharma *et al.*, 2022). An increase in interest in herbal treatment among veterinarians has been noted internationally during the last decade (Prakash *et al.*, 2021). The majority of animals treated with herbal medicines are horses, cattle, sheep, pigs, and goats, followed by dogs (5.3%), poultry (9.1%), and rabbits (4.3%) (Radha *et al.*, 2022). Traditional medicines are the main source of income for pastoral communities in developing countries and the management of livestock is the main source of income for cattle, goats, sheep and camels (Prakash *et al.*, 2021). There was a connection between natural modern medicine's use of medicinal plants to cure ailments and traditional medicine's use of medicinal plants (Rana *et al.*, 2021). There are 47, 513 plant species present in India, representing 11.4% of the total

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world flora. Out of those, 28% are endemic to the country, according to the Botanical Survey of India. The Indian medical ethnoveterinary system, as well as its ecosystem and ethnic cultures, date back over 5000 years. Since antiquity, livestock owners of India have relied on the plant species mentioned for ethnoveterinary use to treat livestock (Sharma *et al.*, 2015). In the current study, local knowledge about medicinal plants was documented, as were the modes of application and the use pattern of plants used to prepare medicinal products used to treat livestock ailments, as well as a comparison between the data collected and previous ethnoveterinary studies conducted in the study region.

## MATERIALS AND METHODS

### Study Area

Because ethnoveterinary practices are still prevalent in the research area, the current study was undertaken in the Chilla range, Shyampur range, Mohand range, and Vindhyavasini hills. It is located in the Haridwar region, near the foothills of the Shiwalik, or sub-Himalayan peaks. Figure 1 represents a Google map of the study sites.

### Survey and investigation methods

In 2019-2021, an ethnoveterinary survey was conducted by visiting ethnic communities in Haridwar. According to the questionnaire, information was acquired through group discussions and semi-structured interviews with traditional healers about the indigenous applications of plant species. A total of 160 people were questioned. Each study location

selects and interviews 40 informants from four separate sites. The ethnoveterinary important plant species were collected during a visit to the study site and identified using various regional floras from the herbaria of the Department of Botany and Microbiology, Gurukula Kangri (Deemed to be University), Haridwar, Uttarakhand, and the Botanical Survey of India.

### Quantitative ethnoveterinary study

The obtained information was quantitatively studied and computed using three quantitative indices: UV (Use-Value), ICF (Informant Consensus Factor), and FL percent (Fidelity Level). Use value is a useful quantitative metric for identifying plant species that are widely and extensively used by indigenous societies (Heinrich *et al.*, 1998; Radha *et al.*, 2019). The FL percent is a quantitative metric that can be used to determine the most commonly used species for treating specific conditions among local informants (Song *et al.*, 2013). In data analysis and calculation, the Informant Consensus Factor (ICF value) is used (Trotter & Logan, 1986).

### Data Analysis

Data was collected through direct interviews with informants, which included locals and traditional herbal healers, and then analyzed and quantified using a Microsoft Excel spreadsheet for various quantitative methodologies. The first quantitative method utilized was use-value (UV), This is used to assess the relative value of plant species known to the informants (Phillips *et al.*, 1994). The use-value as follows

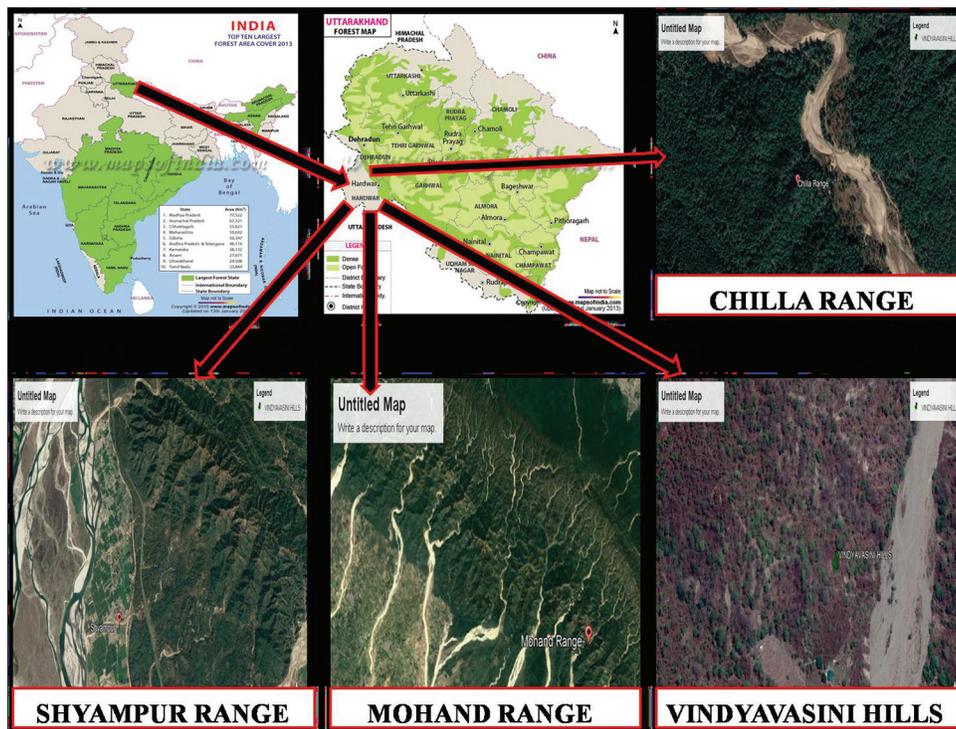


Figure 1: Google map images of different study sites of the Shiwalik range in Haridwar, Uttarakhand

$$UV = \frac{\Sigma U}{n}$$

In the following equation, U represents the number of use reports stated by each informant for a specific species, and n is the total number of informants interviewed. The Informant Consensus Factor was calculated as the second method employed in data analysis and computation (ICF value) (Heinrich *et al.*, 1998). According to Gazzaneo *et al.* (2005), if informants do not share information about use values, then ICF values will be low near 0, and if plants are chosen randomly, then ICF values will be high near 1 if the information is exchanged among informants and there is also a well-defined criterion for the selection of specific plants in an entire population of a specific region (Srithi *et al.*, 2009). The ICF was calculated as,

$$ICF = \frac{nur - nt}{nur - 1}$$

In the above equation, (nur) is the number of usage reports in each disease category, and (nt) is the number of species utilized to cure that disease category in the above equation.

The Fidelity level is the third quantitative metric used to identify the most preferred species among a large number of plant species used to cure specific ailments (Musa *et al.*, 2011). Because many plant species might be utilized in the same disease use category, it is necessary to determine the most preferred plants, which can be analyzed and calculated using these equations,

$$FL\% = \frac{Np}{N} \times 100$$

Np is the number of use reports cited for a given species for the treatment of a specific ailment in this equation, and N is the total number of use reports cited for any given species (Bhatia *et al.*, 2014). A high FL percent value close to 100 percent is obtained for plant species for which almost all usage reports pertain to the same way of use, whereas a low FL percent value is produced for plant species used for a range of reasons (Musa *et al.*, 2011).

## RESULTS

The current study reported 102 plant species that were utilized orally and topically to treat various livestock ailments. Table 1 shows the plant species that were documented during the survey. Among 102 plant species, herbs were the most used life forms (60 species), trees (24), shrubs (16), grasses (1), and ferns (1). All these belong to 55 families in which Lamiaceae (7 species), Solanaceae (6 species), Fabaceae (5 species), Rosaceae (5 species), Asteraceae (5 species), and Apiaceae (4 species) were documented. The method of preparation and administration of the herbal drug to treat livestock diseases using the 102 plants mentioned above is as follows: 81 plant species (79.5 percent) were used orally, 12 plant species (11.7 percent) were used externally/topically and 9 plant species (8.8 percent) were used both externally and orally.

## Demographic Characteristics

The informants were chosen using a snowball sampling procedure. Data were gathered from 160 interviewees, including domestic cattle owners and traditional practitioners, ranging in age from 20 to 80 years. Animal farming is commonly practiced in the villages inhabited by local villagers, nomads, and tribes of the Haridwar region.

## Ethnoveterinary Plants Used

In the study area, 102 plant species from 55 families have been identified, with the Lamiaceae (7 species), Solanaceae (6 species), Fabaceae (6 species), Asteraceae (5 species), Rosaceae (5 species), Apiaceae (4 species), Zingiberaceae (4 species), Amaranthaceae (3 species), Euphorbiaceae (3 species), Liliaceae (3 species) and Pinaceae (3 species) being the dominant families (3 species), while Brassicaceae, Combretaceae, Gentianaceae, Lythraceae, Piperaceae, Plantaginaceae, Poaceae, Polygonaceae, Ranunculaceae (2 species) each were documented. All the plant species of 55 families have cured various major ailments and disorders in livestock as shown in Figure 2.

## Mode of Administration

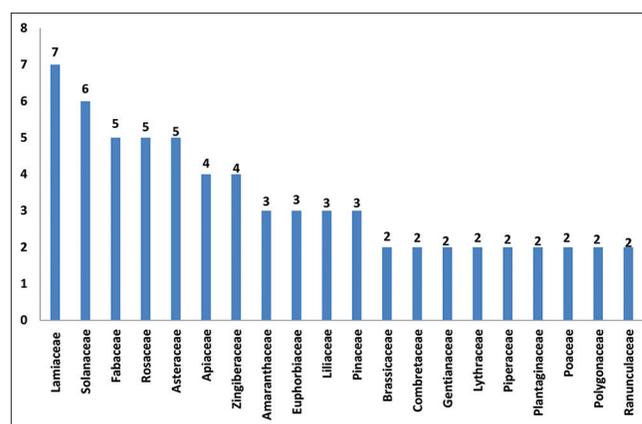
Among 102 plant species, 81 plant species (79.5%) were used orally, 12 plant species (11.7%) were used externally/topically and 9 plant species (8.8%) were used both externally and orally in Figure 3.

## Lifeforms

Among 102 plant species, Herbs were the most used life forms (60 species), trees (24), shrubs (14), grasses (1), and ferns (1) as illustrated in Figure 4.

## Plant Parts Used

In Figure 5, Leaves were the most frequently used plant parts (27.1 percent), whole plant (17.7 percent), seeds (16.8 percent), and fruits (15.8 percent), while the least commonly used plant



**Figure 2:** Graph showing the number of plant species belonging to their families

Table 1: Medicinal plants species and methods of ethnobotanical treatment of livestock in Haridwar, Uttarakhand

S. No	Name of Plant species	Local name	Family	Life Forms	Plant parts used	Uses/Citation quoted	Methods of using the formulations or raw medicinal plants	o/e	ΣU	UV	Collector No. assigned
1.	<i>Abies webbiana</i> (Wall. ex D. Don) Lindl.	Raisal, barmi	Pinaceae	Tree	Bud	Cough	To relieve cough, 200ml of bud decoction in two litres of water is administered twice a day.	o	38	0.23	SRH-1
2.	<i>Acacia catechu</i> (L. f.) Willd.	Khair	Fabaceae	Tree	Stem	Urinary tract infections (26), dysentery (14)	One cup of 100 ml stems decoction in half a litre of water, three times a day.	o	40	0.25	SRH-2
3.	<i>Achyranthes Aspera</i> L.	Chirchira	Amaranthaceae	Shrub	Whole plant	Tooth ache (48), Gum bleeding (42).	A palmful of the whole plant in a alliterate of water will help with tooth problems.	o	90	0.56	SRH-3
4.	<i>Achyranthes bidentata</i> Blume	Dansh	Amaranthaceae	Herb	Root	Laxative	100ml root decoction made in half litre water given two times a day.	o	44	0.27	SRH-4
5.	<i>Aconitum balfourii</i> Stapf	Vatsnabh	Ranunculaceae	Herb	Root	Wounds	2 or 3 matured roots in one litre of oil are applied as an ointment.	e	72	0.45	SRH-5
6.	<i>Acorus calamus</i> L.	Banj	Araceae	Herb	Rhizome	Fever (52), Pain (63), Helminthic infestation (88)	2 matured roots with fibrous food given once daily.	o, e	2031.26		SRH-6
7.	<i>Adiantum venustum</i> D. Don	Hansraj	Pteridaceae	Fern	Seed	Chest problem (53), hair fall (22)	1 palmful seed given with fibrous food	o	75	0.46	SRH-7
8.	<i>Haldina cordifolia</i> (Roxb.) Ridsdale.	Haldu	Rubiaceae	Tree	Bud, leaf	Wound healing (66), fever (52)	Applying bud paste on the wound. Ino, a decoction of leaves is given three times a week.	e	1180.73		SRH-8
9.	<i>Aesculus indica</i> (Wall. ex Cambess.) Hook.	Pangar	Sapindaceae	Tree	Fruit, leaves	Stomach problem (40), Pneumonia (68), indigestion (51), and helminthic infestation (49)	One palmful of fruit decoction in half a liter of water with jaggery.	o	208	1.3	SRH-9
10.	<i>Agrimonia pilosa</i> Ledeb.	Ledeb	Rosaceae	Herb	Whole plant	blood purification	In the morning, plant decoction is given with jaggery.	o	52	0.32	SRH-10
11.	<i>Ajuga parviflora</i> Benth	Ratpatia	Lamiaceae	Herb	Whole plant	Arthritis (45), Fever (24), indigestion (76).	For four to five days, one palmful of the entire plant decoction is taken twice a day.	o	1450.90		SRH-11
12.	<i>Allium cepa</i> L.	Piyaz	Liliaceae	Herb	Whole Plant	Stomach problem (140), Indigestion (92).	Two palmfuls of hole plus gave thrice a day. The bulb is ground and combined with black salt before being taken with water.	o	23223.2		SRH-12
13.	<i>Allium sativum</i> L.	Jangali Lasun	Liliaceae	Herb	Whole Plant	Fever (62), Skin allergy (94).	Whole plants are boiled in water and given twice a day. Crushed leaves decoction and juice drink with warm water.	o, e	1560.97		SRH-13
14.	<i>Aloe vera</i> (L.) Burm. f.	<i>Aloe vera</i>	Liliaceae	Herb	Leaves	Stomach problem (138), Weakness (43), paralysis (27).	Juice of leaves given half cup a day, Juice mixed in the flour.	o	208	1.3	SRH-14
15.	<i>Althaea officinalis</i> L.	Jangalihaul	Malvaceae	Herb	Root	Pregnancy termination	Three or four settled root decoctions in one liter of water are administered three times each week.	o	14	0.08	SRH-15
16.	<i>Anagallis arvensis</i> L.	Vish Khaparia	Primulaceae	Herb	Fruit, Leaf	Pain killer	Twice a day, two palmfuls of fruit and leaves are provided.	o	32	0.2	SRH-16
17.	<i>Artemisia nilagirica</i> (C.B.Clarke) Pamp.	Damanak	Asteraceae	Herb	Whole Plant	Urinary tract infection (132), helminthic infestation (108).	One palmful of whole plant body decoction in 1/2 liter of water with jaggery.	o	240	1.5	SRH-17
18.	<i>Artemisia gmelinii</i> Weber ex Stechm.	Jholpatti	Asteraceae	Shrub	Leaf, Bud	Hair fall	Leaves and bud decoction in half-liter water are given twice a day.	o	77	0.48	SRH-18
19.	<i>Atropa belladonna</i> L.	Dhatura	Solanaceae	Herb	Leaf, root	In injury as a pain killer	The ointment is made from a paste of one palmful of leaves burned in oil.	o, e	1450.90		SRH-19
20.	<i>Berberis aristata</i> DC.	Kilmori	Berberidaceae	Shrub	Root, stem	Fever (84), weakness (16).	Root or stem decoction in half a liter of water	o	1000.62		SRH-20
21.	<i>Bergenia ciliata</i> (Haw.) Stern.	Silphora	Saxifragaceae	Herb	Rhizome	Hydrophobia	Two palmfuls of root decoction in half a liter of water, one cup three times a day	o	38	0.23	SRH-21
22.	<i>Betula utilis</i> D. Don	Bhojpatra	Betulaceae	Tree	Seed, Leaves	Helminthic infestation	2 small spoons are given daily for 3 days.	o	1420.88		SRH-22

(Contd...)

Table 1: (Continued)

S. No	Name of Plant species	Local name	Family	Life Forms	Plant parts used	Uses/Citation quoted	Methods of using the formulations or raw medicinal plants	o/e	ΣU	UV	Collector No. assigned
23.	<i>Boerhavia diffusa</i> L.	Parnata	Nyctaginaceae	Herb	Leaf	Blood dysentery (42), Weed intoxication (78)	dropsy Juice of leaves thrice a day.	o	1200.75		SRH-23
24.	<i>Brassica rapa</i> L.	Kali Sarson	Brassicaceae	Herb	Seed	Poor appetite (62), Helminthic infestation (58), bone fracture (158), and indigestion (35)	Two palmfuls of seed are given twice a day with fibrous meals and jaggery.	o, e	3131.95		SRH-24
25.	<i>Butea monosperma</i> (Lam.) Taub.	Palash	Fabaceae	Tree	Flower, Seed	Painkiller	The flower and seed paste is given three times in three days.	o	46	0.28	SRH-25
26.	<i>Calendula officinalis</i> L.	Genda	Asteraceae	Herb	Leaf, Flower	Bleeding	The juice of the leaves helps in bleeding.	o	28	0.17	SRH-26
27.	<i>Calotropis procera</i> (Aiton) Dry and.	Aaka	Apocynaceae	Tree	Root, leaves	Indigestion	Root or leaf decoction in one liter of water, one cup twice a day	o	24	0.15	SRH-27
28.	<i>Canna indica</i> L.	Kewara	Cannaceae	Tree	Root	Indigestion (84), Helminthic infestations (82)	one bunch of roots is given with jaggery.	o	1661.03		SRH-28
29.	<i>Capsella bursa-pastoris</i> (L.) Medik.	Torighash	Brassicaceae	Herb	Whole plant	Wounds	For vigor, two palmfuls of whole plant decoction in water are given twice.	o	33	0.20	SRH-29
30.	<i>Capsicum annum</i> L.	March	Solanaceae	Herb	Fruit	Oil massage on skin problem (53), Helminthic infestation (62)	Fruit decoction in two liters of water is given.	o, e	1150.71		SRH-30
31.	<i>Cedrus deodara</i> (Roxb. ex D.Don) G.Don	Deodar	Pinaceae	Tree	Resin	Skin diseases	Resin is obtained from the bark and rubbed.	e	43	0.26	SRH-31
32.	<i>Centella asiatica</i> (L.) Urb.	Brahmi	Apiaceae	Herb	Leaf	Brain fever	During fever, a paste made from green leaves is applied to the forehead.	e	92	0.57	SRH-32
33.	<i>Chenopodium album</i> L.	Bethuwa	Amaranthaceae	Herb	Leaf, seed	Helminthic infestation	2 palmful seed is given before breakfast once a day for three days.	o	53	0.33	SRH-33
34.	<i>Cinnamomum tamala</i> (Buch. -Ham.) T.Nees & Ebert.	Tezpatta	Lauraceae	Herb	Leaf	Stomach problem (66), Gastric problem (34)	Bark powder with fibre food is helpful in gastric problems.	o	1000.62		SRH-34
35.	<i>Citrus medica</i> L.	Number	Rutaceae	Tree	Fruit	Indigestion	Fresh juice with half spoon salt in half litre water.	o	1550.96		SRH-35
36.	<i>Clerodendrum infortunatum</i> L.	Bhat	Lamiaceae	Shrub	Bark	Dung is extra solid	Powdered bark decoction in two liters of water given one cup thrice a day.	o	14	0.08	SRH-36
37.	<i>Coriandrum sativum</i> L.	Danya	Umbelliferae	Herb	Seeds	Snakebite (72), Weed intoxication (93)	Seed powder mixed with water and administered to drink	o	1651.03		SRH-37
38.	<i>Cuminum cyminum</i> L.	Jeera	Apiaceae	Herb	Seed	Indigestion	100 g of seed in half a litre of water is given daily.	o	1320.82		SRH-38
39.	<i>Curcuma longa</i> L.	Haldar	Zingiberaceae	Herb	Rhizome	Bone fracture (160), Gastric problem (128), Helminthic infestation (132).	Paste or powder in half-liter water given thrice a day.	o, e	4202.62		SRH-39
40.	<i>Curcuma angustifolia</i> Roxb.	Banhaldi	Zingiberaceae	Herb	Rhizome	Gastric problem (128), Helminthic infestation (132)	Paste of root is useful and given 2 to 3 times for one week.	o	2601.62		SRH-40
41.	<i>Datura metal</i> L.	Dhatara	Solanaceae	Shrub	Seed	Pain killer	Massage is administered using 25g dried cooked seeds in 100ml olive oil.	e	1220.76		SRH-41
42.	<i>Datura stramonium</i> L.	Dhatara	Solanaceae	Herb	Leaf	In injury as a pain killer	As an ointment, make a paste of one palmful of leaves.	e	1200.75		SRH-42
43.	<i>Delphinium denudatum</i> Wall. ex Hook. f. & Thomson	Nirwisi	Ranunculaceae	Herb	Seed, root	Ticks (55), Snakebite (128)	Seed decoction in half a liter of water is taken twice a day.	o	1831.14		SRH-43
44.	<i>Digitalis purpurea</i> L.	Pravasi	Plantaginaceae	Herb	Leaf	Skin Burns	One palmful of the leaves is roasted with oil and used as an ointment twice a day.	e	44	0.27	SRH-44

(Contd...)

Table 1: (Continued)

S. No	Name of Plant species	Local name	Family	Life Forms	Plant parts used	Uses/Citation quoted	Methods of using the formulations or raw medicinal plants	o/e	ΣU	UV	Collector No. assigned
45.	<i>Phyllanthus emblica</i> L.	Amla	Phyllanthaceae	Tree	Fruits	Conjunctivitis (85), indigestion (122), helminthic infestation (98), and weed intoxication (85)	2 palmful fruits powder with fibrous foods.	o	3051.90		SRH-45
46.	<i>Ephedra gerardiana</i> var. <i>sikkimensis</i> Stapf	Judging	Ephedraceae	Shrub	Stem	Painkiller	One cup of a decoction of one bunch of stem pieces in 2 liters of water is given in the morning.	o	44	0.27	SRH-46
47.	<i>Equisetum arvense</i> L.	Horsetail	Equisetaceae	Herb	Whole plant	Urinary problem	Half a palmful of whole plant decoction in one liter of water, taken twice daily for five days.	o	27	0.16	SRH-47
48.	<i>Euphorbia prolifera</i> Buch. -Ham. ex D. Don	Duwila	Euphorbiaceae	Herb	Fruit	Dog bite	Fruit powder is helpful and should be taken once every three days.	o	1320.82		SRH-48
49.	<i>Ferula assa-foetida</i> L.	Heeng	Apiaceae	Herb	Root	Indigestion	5 matured roots decoction in half-liter lukewarm water given twice a day.	o	144	0.9	SRH-49
50.	<i>Foeniculum vulgare</i> Mill.	Saunf	Apiaceae	Shrub	Seed	Helminthic infestations	1 palmful seed in half litre water given in the morning.	o	1340.83		SRH-50
51.	<i>Comastoma tenellum</i> (Rottb.) Toyok.	kutki	Gentianaceae	Herb	Fruits	Hysteria (146), weakness (90)	50g of fruit bark decoction in one liter of water, one cup with honey each day	o	2361.47		SRH-51
52.	<i>Glycine max</i> (L.) Merr.	Bhatt	Fabaceae	Herb	Seeds	Dermatitis	Glycine max seeds are ground and consumed with water.	o	26	0.16	SRH-52
53.	<i>Hedychium spicatum</i> Sm.	Kapur Kachari	Zingiberaceae	Herb	Rhizome	Fever (52), cold (24)	The root is given with jaggery and sugar and given thrice in a week.	o	76	0.47	SRH-53
54.	<i>Hyoscyamus niger</i> L.	Bane	Solanaceae	Herb	Seed	Pain killer	The ointment is prepared from a paste of both the leaves and seeds.	e	1080.67		SRH-54
55.	<i>Juglans regia</i> L.	Akhrot	Juglandaceae	Tree	Leaf, fruit	Stomach problem (144), helminthic infestations (137), Bone injury (160)	One cup of a decoction of two palm leaves or two green fruits in one liter of water is given three times a day with two spoons of honey.	o	4412.75		SRH-55
56.	<i>Juniperus communis</i> L.	Jhora	Cupressaceae	Tree	Fruit, leaves	Liver disease	10-12 fruits or leavegaveen daily for one week.	o	66	0.41	SRH-56
57.	<i>Lobelia nicotianifolia</i> Roth ex Schult.	Bran tambacoo	Campanulaceae	Herb	Whole Plant	Liver disease	Whole plant decoction in half a litre of water given 2-3 times a day, with one spoon of honey.	o	43	0.26	SRH-57
58.	<i>Lycopersicon esculentum</i> Mill.	Tamatar	Solanaceae	Herb	Fruit	Stomach problem	Juice of fruit is given one time a day	o	46	0.28	SRH-58
59.	<i>Mallotus philippensis</i> (Lam.) Müll.Arg.	Roli	Euphorbiaceae	Tree	Fruit	Helminthic infestation	Once a day, 1 palmful of fibrous food combined with fruit extract is given.	o	32	0.20	SRH-59
60.	<i>Mangifera indica</i> L.	Aam	Anacardiaceae	Tree	Fruit, leaves	Weed intoxication (128), Foot and Mouth Diseases (102)	Juice of fruits given thrice a day. Leaves are directly used to eat.	o	2301.43		SRH-60
61.	<i>Melilotus albus</i> Medik.	Lamk. Banmethi	Fabaceae	Herb	Whole plant	Stomach problem (82), Indigestion (28)	Whole plant decoction is given in a day	o	1100.68		SRH-61
62.	<i>Mentha arvensis</i> L.	Pudina, Eliachi	Lamiaceae	Herb	Whole plant	Post pregnancy problems	Whole plant decoction in one liter of water, taken three times a week.	o	88	0.55	SRH-62
63.	<i>Musa × paradisiaca</i> L.	Kela	Musaceae	Herb	Pulp, rhizome	Weed intoxication	Paste of root is given daily for one week.	o	95	0.59	SRH-63
64.	<i>Ocimum tenuiflorum</i> L.	Tulsi	Lamiaceae	Herb	Whole plant, Leaves	Fever (140), Conjunctivitis (132)	2 palmfuls of the whole plant are given twice a day.	o, e	2721.70		SRH-64
65.	<i>Origanum vulgare</i> L.	Jangali tulsi	Lamiaceae	Herb	Whole plant	Indigestion	Entire plant with fibre food twice a day	o	77	0.48	SRH-65
66.	<i>Oryza sativa</i> L.	Dhan	Poaceae	Herb	Seeds	Cough	The seeds are roasted in water and juice.	o	32	0.20	SRH-66
67.	<i>Phlomis umbrosa</i> (Turcz.) Karelin & Makhm.	Circa	Lamiaceae	Herb	Leaf	Bone injury	As an ointment for bone injuries, make a paste of the leaves in water.	e	86	0.53	SRH-67

(Contd...)

Table 1: (Continued)

S. No	Name of Plant species	Local name	Family	Life Forms	Plant parts used	Uses/Citation quoted	Methods of using the formulations or raw medicinal plants	o/e	ΣU	UV	Collector No. assigned
68.	<i>Pinus roxburghii</i> Sarg.	Chir	Pinaceae	Tree	Resin	External parasites	15g Resin with oil coconut oil	e	78	0.48	SRH-68
69.	<i>Piper longum</i> L.	Pipali	Piperaceae	Herb	fruit	Low appetite	Fruit powder massaged with oil can help with a loss of appetite. Massage with oil and powder is beneficial.	e	76	0.47	SRH-69
70.	<i>Piper nigrum</i> L.	Kali march	Piperaceae	Herb	Seeds	Snakebite	100 g seeds in 1-liter water, one cup 2-3 times per day	o	1090.68		SRH-70
71.	<i>Plantago major</i> L.	Vrantak	Plantaginaceae	Herb	Leaf	Injury (67), teeth problem (98), fever (55)	A paste of leaves in water can be used to treat injuries and tooth discomfort. For fever, make a decoction of two bunches of leaves in one liter of water and drink it three times a day.	o,	e2201.37		SRH-71
72.	<i>Potentilla argyrophylla</i> Wall. ex Lehm.	Brajdanti	Rosaceae	Herb	Leaf, Root	Stomach problem	Matured root decoctions in half litre water given three times a day.	o	58	0.36	SRH-72
73.	<i>Prunus persica</i> (L.) Batsch	Aru	Rosaceae	Tree	Leaf	Wounds	Externally, leaf paste is being used to remove germs on wounds.	e	35	0.21	SRH-73
74.	<i>Punica granatum</i> L.	Daram	Lythraceae	Shrub	Fruit	Antimicrobials	One palmful of fruit decoction in half a liter of water, one cup three times a day with jaggery.	o	33	0.20	SRH-74
75.	<i>Quercus floribunda</i> Lindl. ex A. Camus	More	Fagaceae	Tree	Bark	Dysentery	Bark decoction in one liter of water is given.	o	12	0.07	SRH-75
76.	<i>Quercus semecarpifolia</i> Sm.	Kharsu	Fagaceae	Tree	Bark	Dysentery (14)	Bark decoction in 1 cup of water twice a day.	o	14	0.08	SRH-76
77.	<i>Rhamnus virgata</i> Roxb.	Chaitula	Rhamnaceae	Shrub	Fruit	Leg swelling (43)	Daily intake of 5 matured fruit extracts in half a litre of water.	o	43	0.26	SRH-77
78.	<i>Rheum australe</i> D. Don	Dolu, Archa	Polygonaceae	Herb	Root	Blood purification (27), Body weakness (15)	One matured root extract in 1-liter water, three times a day for vigor.	o	42	0.26	SRH-78
79.	<i>Ricinus communis</i> L.	Erindi	Euphorbiaceae	Shrub	Leaf	Internal injury	This plant's oil is useful. Heat therapy using leaves is beneficial.	e	10	0.06	SRH-79
80.	<i>Rosa moschata</i> Herrm.	Kunj pani	Rosaceae	Shrub	Fruit	Leukorrhoea (14), bleeding (8), Pregnancy termination (12).	Every day, two palmfuls of fruit with one spoon of honey are given.	o	34	0.21	SRH-80
81.	<i>Rubus paniculatus</i> Sm	(Kad ula)	Rosaceae	Shrub	Leaf	Pregnancy	Two palmful leaves decoction in half litre water, 1 cup twice daily.	o	18	0.11	SRH-81
82.	<i>Rumex hastatus</i> D. Don	Bhilmora	Polygonaceae	Shrub	Whole plant	Skin disease (22), fever (8)	Entire plant decoction in half-liter water is given.	o	30	0.18	SRH-82
83.	<i>Saccharum officinarum</i> L.	Ganna	Poaceae	Grass	Leaves, juice	Diarrhea (128) and Helminthic infestation (129)	Juice freshly made is given thrice a day.	o	2571.60		SRH-83
84.	<i>Salvia mukerjeei</i> Bennet & Raizada	Sania	Lamiaceae	Herb	Whole plant	Vomiting (43), painkiller (42)	3 times a day, 2 palmfuls of the whole plant with jaggery and fiber food.	o	85	0.53	SRH-84
85.	<i>Sesamum indicum</i> L.	Till	Pedaliaceae	Herb	Seeds	Snakebite (52), Weed intoxication (33)	Poisoning is cured by crushing seeds with water.	o	85	0.53	SRH-85
86.	<i>Swertia ciliata</i> (D. Don ex G. Don) B.L. Burt	Chiraita	Gentianaceae	Herb	Whole Plant	Weakness (12), fever (6), loss of appetite (22)	Entire plant decoction in 1-liter water is given.	o	40	0.25	SRH-86
87.	<i>Tagetes erecta</i> L.	Hazari	Asteraceae	Herb	Fruit, leaves	In vomiting (32), In healing wounds (22) and Broken horns (84)	When vomiting, 1 palmful of fruit is given with a fibrous meal. Its topical usage is in wound filling.	o,	e1380.86		SRH-87
88.	<i>Tamarindus indica</i> L.	Imlu	Caesalpiniaceae	Tree	Fruit	Weed intoxication (153) and snakebite (131)	100g in one liter of water mixed with honey is given twice a day.	o	2841.77		SRH-88
89.	<i>Tanacetum nubigenum</i> Wall. ex DC.	Gotpul	Asteraceae	Herb	Leaf, Fruit	As energy syrup (33), Anti-microbial (25)	One palmful of leaf or fruit decoction in 1 liter of water with 1 spoonful of honey	o	58	0.36	SRH-89
90.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahera	Combretaceae	Tree	Fruit	Diarrhea (26), Indigestion (44)	5 to 6 fruits are given twice a day.	o	70	0.43	SRH-90

(Contd...)

Table 1: (Continued)

S. No	Name of Plant species	Local name	Family	Life Forms	Plant parts used	Uses/Citation quoted	Methods of using the formulations or raw medicinal plants	o/e	ΣU	UV	Collector No. assigned
91.	<i>Terminalia chebula</i> Retz.	Harad	Combretaceae	Tree	Fruit	Indigestion	100g in one liter of water mixed with honey is given twice a day.	o	1550.96		SRH-91
92.	<i>Thymus serpyllum</i> L.	Van ajmain	Lamiaceae	Shrub	Whole plant	Chest pain	Whole plant decoction in half a liter of water in a week	o	1100.68		SRH-92
93.	<i>Trachyspermum ammi</i> (L.) Sprague	Ajwain	Papilionaceae	Herb	Seed	Diarrhoea (121), constipation (112), indigestion (133)	100g seeds in 1-liter water, one cup three times a day.	o	3362.10		SRH-93
94.	<i>Trifolium repens</i> L.	Garila	Fabaceae	Herb	Whole plant	Indigestion	Four palmfuls of the entire plant are given twice a day	o	63	0.39	SRH-94
95.	<i>Tylophora hirsuta</i> Wight	Tripu	Asclepiadaceae	Shrub	Stem	Conjunctivitis	Two palmfuls of the stem are given twice a day.	o	112	0.7	SRH-95
96.	<i>Urtica dioica</i> L.	Soy	Urticaceae	Herb	Leaf	Skin disease (132), Lactation (68)	Leaves are taken with fibrous food 3-4 times every day.	o	2001.25		SRH-96
97.	<i>Verbascum thapsus</i> L.	Akalvir	Scrophulariaceae	Herb	Leaf	Bronchitis	One palmful of leaves decoction in half a liter of water, one cup three times a day	o	92	0.57	SRH-97
98.	<i>Viola biflora</i> L.	Banpansa	Violaceae	Herb	Whole plant	Heart problem (45), Skin problem (46)	Two palmfuls of the whole plant twice a day for infection. Three/ four palmfuls of whole plant d a spoon of honey given twice for heart and skin problems.	o, e	91	0.56	SRH-98
99.	<i>Viscum album</i> L.	Bana	Santalaceae	Tree	Fruits	Pregnancy problem	For approximately two weeks, 6 fruits with milk are given twice a day.	o	34	0.21	SRH-99
100.	<i>Vitex negundo</i> L.	Bana	Verbenaceae	Shrub	Leaves	Diarrhea	Leaves decoction in half litre water in a day.	o	23	0.14	SRH-100
101.	<i>Woodfordia fruticosa</i> (L.) Kurz	Salisb	Lythraceae	Shrub	Flower	Energy syrup	1 palmful dry flower decoction in water 2 times a day.	o	11	0.06	SRH-101
102.	<i>Zingiber officinale</i> L. Roscoe	Adrak	Zingiberaceae	Herb	Rhizome	Helminthic infestations (124), Pneumonia (112), Fever (150), Chest problem (42)	Paste of root is given daily for one week.	o	4282.67		SRH-102

UV – use-value, ΣU– total number of citations, o/e- Mode of administration, e- externally used, o- orally used, SRH – Collector number assigned

parts were roots (6.5 percent), rhizome (6.5 percent), bark (2.8 percent), flower (1.8 percent), buds (1.8 percent), resins (1.8 percent) and stem (1.4 percent).

#### Use-Value

The Use values ranged from 0.06 to 2.75 show that the most important species with high UV values for curing the ailing domestic animals were *Z. Officinale* Roscoe (UV = 2.67), *Curcuma longa* L. (UV = 2.62), *Allium cepa* L. (UV = 23.2), *Trachyspermum ammi* L. (UV = 2.10), *Brassica campestris* L. (UV = 1.95), *Phyllanthus emblica* L. (UV = 1.90), *Tamarindus indica* L. (UV = 1.77), *Ocimum sanctum* L. (UV = 1.70), *Curcuma angustifolia* Roxb. (UV = 1.62), *Saccharum officinarum* L. (UV = 1.60), *Mangifera indica* L. (UV = 1.43), *Urtica dioica* L. (UV = 1.25), *Coriandrum sativum* L. (UV = 1.03) etc. (Table 1). Species with low use values were *Woodfordia fruticosa* (L.) Kurz. (UV = 0.06), *Ricinus communis* L. (UV = 0.06), *Quercus floribunda* Lindl. ex A.Camus (UV = 0.07), *Quercus semecarpifolia* Sm. (UV = 0.08) and *Rubus paniculatus* Sm. (UV = 0.11) (Table 1). The low usage value of plants may indicate the low distribution of species in the area as well as informants' limited ethnomedicinal expertise. The high use citations of

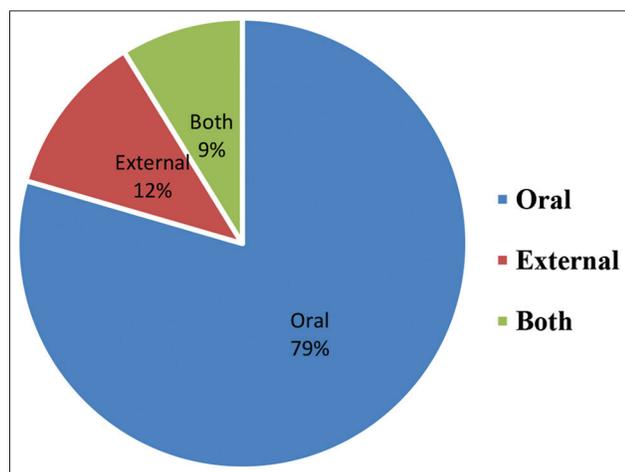
*Z. officinale* and *C. longa* (Table 1), could be attributed to their widespread distribution, great nutritional properties, and low forage cost, with the added benefit of presumed medicinal powers.

#### Informant Consensus Factor (ICF)

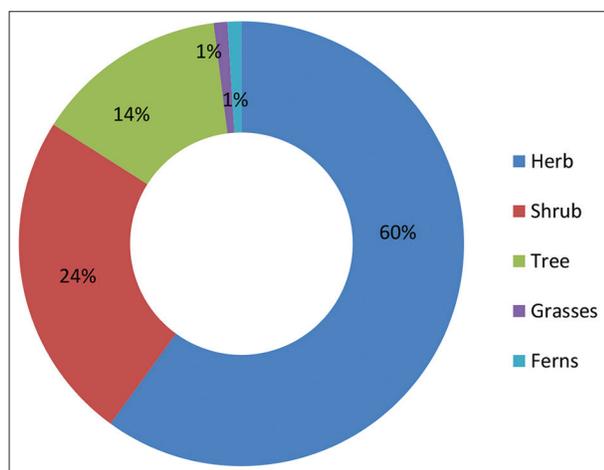
The Informant Consensus Factor (ICF) is a fundamental quantitative metric used to determine the degree of information sharing regarding plant species among informants for a specific illness category. The ICF values in this study varied between 0.97 and 0.99. (Table 2). The high ICF values indicate that the informants interviewed have their traditional knowledge Bone fracture (ICF=0.99), ocular disorders (ICF=0.99), and poisoning (ICF=0.99) had the highest consensus factor values. Other significant disease categories included: Dermatological ailments, Fever, Gastrointestinal disorders, Parasites, Injuries, Antimicrobials, Cardiac disorders, Musculoskeletal disorders, Chest Problems and Ur, and urinary disorders having a consensus value (ICF = 0.98), Reproductive disorders, Energy and Vigour boosters having consensus factor values of 0.97. The current study also reported high ICF values, indicating a high degree of sharing of ethnomedicinal knowledge among the informants.

**Fidelity Level (FL%)**

The FL% values ranged from 27.8 to 100 percent. The FL% result of 100 percent for a certain plant species demonstrated that all use reports cited by informants mentioned the



**Figure 3:** Pie chart showing the mode of administration in ethnoveterinary medicine

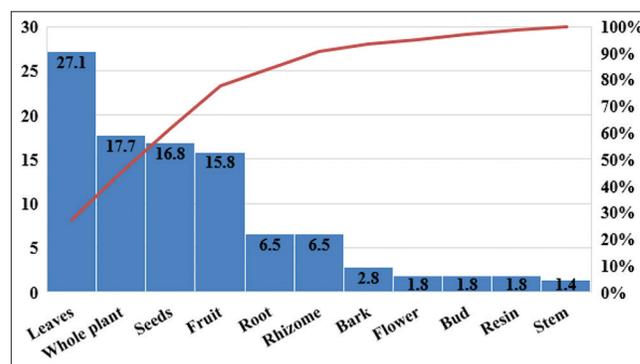


**Figure 4:** Lifeforms present in the study area

same approach for treating the plant. *Tamarindus indica* L., *Coriandrum sativum* L. (Poisoning), *Citrus medica* L., *Ferula assafoetida* L., *Terminalia chebula* Retz., *Trachyspermum Ammi* (L.) Sprague (Gastrointestinal disorders), *Euphorbia prolifera* Buch-Ham. ex D. Don, *Datura metal* L. and *Datura stramonium* L. were the most preferred plants with high citations and 100 percent FL percent values in (injuries) Table 3. The presence of a disease in the research region and the usage of plant species by local people to treat it is indicated by a species' high-fidelity score.

**DISCUSSIONS**

Therapeutic plants have played an important role in the lives of the people who reside in these areas by providing medicinal remedies. Due to poor livestock healthcare maintenance in Haridwar's remote areas, tribal people have adopted the ancient method of treating their livestock through plant-based medications, which are mainly made by local herbal practitioners based on their traditional expertise. Their herbal medicines were extremely efficient in curing common diseases like diarrhea, skin diseases, and foot and mouth diseases. The current research found 102 plant species used orally and topically to cure animal diseases. Table 1 shows the plant species that were documented during the survey. Among 102 plant species, herbs were the most used life forms (60 species), trees (24), shrubs (16), grasses (1), and ferns (1). All these



**Figure 5:** Graph showing the plant parts used in the treatment of animals

**Table 2: ICF values of various plant species used for curing different categories of ailments & disorders**

S. No	Category of Ailments and disorders	Number of species	No. of Citations	ICF
1.	Bone fracture (broken horns, bone fracture, and dislocations)	5	648	0.99
2.	Dermatological disorders (skin burns, allergy, hair loss, foot & mouth diseases)	11	661	0.98
3.	Fever (chills, cold, cough, pneumonia, and brain fever)	15	1051	0.98
4.	Gastrointestinal disorders (diarrhea, indigestion, constipation, loss of appetite, dysentery, laxative, vomiting, liver diseases)	35	3071	0.98
5.	Ophthalmic disorders (conjunctivitis)	2	244	0.99
6.	Parasite (endo -parasites and ectoparasites)	18	1693	0.98
7.	Poisoning (snake bite and weed poisoning)	8	1079	0.99
8.	Injuries (dog bite, hysteria, hydrophobia, bleeding, internal injuries, painkillers, wounds)	22	1359	0.98
9.	Antimicrobials	2	58	0.98
10.	Chest Problems and Urinary disorders	7	482	0.98
11.	Reproductive disorders	6	248	0.97
12.	Cardiac disorders (heart problems, blood purification)	2	97	0.98
13.	Energy and Vigour booster (Weakness)	6	205	0.97
14.	Musculoskeletal disorders (toothache, gum bleeding, arthritis, paralysis, leg swelling)	5	303	0.98

ICF- Informant Consensus Factor

**Table 3: FL% of different plant species used for curing different categories of ailments & disorders**

S. No	Category of Ailments and disorders	Plant species	Citations	FL %
1.	Bone fracture (broken horns, bone fracture, and dislocations)	<i>B. campestris</i>	158	50.4
		<i>C. longa</i>	160	38
		<i>J. Regia</i>	160	36.2
2.	Dermatological disorders (skin burns, allergy, hair loss, foot & mouth diseases)	<i>A. sativum</i>	94	60.2
		<i>U. dioica</i>	132	66
		<i>C. deodara</i>	43	100
3.	Fever (chills, cold, cough, pneumonia, and brain fever)	<i>Z. officinale</i>	150	35.0
		<i>C. annum</i>	53	46.0
		<i>C. asiatica</i>	92	100
		<i>D. purpurea</i>	44	100
4.	Gastrointestinal disorders (diarrhea, indigestion, constipation, loss of appetite, dysentery, laxative, vomiting, liver diseases)	<i>A. barbadensis</i>	138	66.3
		<i>C. medica</i>	155	100
		<i>C. cyminum</i>	132	100
		<i>F. asafoetida</i>	144	100
		<i>T. chebula</i>	155	100
5.	Ophthalmic disorders (conjunctivitis)	<i>T. ammi</i>	336	100
		<i>T. hirsuta</i>	112	100
		<i>O. sanctum</i>	132	48.5
6.	Parasite (endo -parasites and ecto -parasites)	<i>E. officinalis</i>	85	27.8
		<i>C. Angustifolia</i>	132	50.7
		<i>F. vulgare</i>	134	100
7.	Poisoning (snake bite and weed poisoning)	<i>S. officinarum</i>	129	50.1
		<i>P. roxburghii</i>	78	100
		<i>C. sativum</i>	165	100
		<i>D. denudatum</i>	128	70
8.	Injuries (dog bite, hysteria, hydrophobia, bleeding, internal injuries, painkillers, wounds)	<i>M. indica</i>	128	55.6
		<i>T. indica</i>	284	100
		<i>D. metal</i>	122	100
9.	Antimicrobials	<i>D. stramonium</i>	120	100
		<i>E. prolifera</i>	132	100
		<i>H. niger</i>	108	100
10.	Chest Problems and Urinary disorders	<i>P. granatum</i>	33	100
		<i>A. nilagirica</i>	132	55
		<i>E. arvense</i>	27	100
		<i>T. serpyllum</i>	110	100
11.	Reproductive disorders	<i>V. thapsus</i>	92	100
		<i>A. officinalis</i>	14	100
		<i>M. arvensis</i>	88	100
12.	Cardiac disorders (heart problems, blood purification)	<i>R. moschata</i>	24	100
		<i>R. paniculatus</i>	18	100
		<i>R. emodi</i>	27	64.2
13.	Energy and Vigour booster (Weakness)	<i>V. biflora</i>	45	50
		<i>T. nubigenum</i>	35	60.3
14.	Musculoskeletal disorders (toothache, gum bleeding, arthritis, paralysis, leg swelling)	<i>A. aspera</i>	90	100
		<i>R. virgate</i>	43	100
		<i>P. major</i>	98	44.5

FL- Fidelity level

belong to 55 families in which Lamiaceae (7 species), Solanaceae (6 species), Fabaceae (5 species), Rosaceae (5 species), Asteraceae (5 species), and Apiaceae (4 species) were documented. The procedure for preparation and administration of the herbal drug to treat livestock diseases using the 102 plants mentioned above is as follows: 81 plant species (79.5 percent) were used orally, 12 plant species (11.7 percent) were used externally/topically, and 9 plant species (8.8 percent) were used both externally and orally.

## CONCLUSIONS

The current study details 102 ethnomedicinal species and their therapeutic applications serve as a model for phytochemical

and pharmacological research by healers from all indigenous communities calculated in the study region. Because of their poor income and the high cost of western pharmaceuticals, local populations in the region use a variety of medicinal herbs to heal cattle. Traditional healers are quite skilled in preparing herbal mixtures of medicinal herbs. Gastrointestinal diseases were the most common in the study sites; thus, cattle should be provided with high-quality feed and water. Plants with a high informant consensus factor and Fidelity level should undergo additional *in vitro* phytochemical testing. The study found that ethnoveterinary practices are still common in the study sites, emphasizing the significance of documenting traditional ethnomedicinal knowledge before these unique resources are lost. Young people should be encouraged to become interested in ethnoveterinary practices to preserve this information.

## ACKNOWLEDGMENT

The corresponding author is grateful to the Head, Department of Botany and Microbiology, Gurukula Kangri (Deemed to be a university), Haridwar for all the support and facilities. We are also thankful to informants, traditional healers, and local communities for their cooperation and sharing of precious indigenous information.

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