

ETHNOVETERINARY STUDIES OF TRADITIONAL MEDICINAL PLANTS IN SHIVALIK RANGES OF UTTARAKHAND

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Ethnoveterinary medicines are used effectively for primary health care treatment to make domestic animals productive and healthy. The indigenous knowledge of the veterinary health care system acquired by traditional herbal healers (Pashu Vaidyas) is orally disseminated from one generation to another generation. This paper compiles and evaluates the ethnobotanical data currently available on medicinal plants traditionally used for livestock ailments in various regions of Uttarakhand. According to the sources, for various generations, the treatment and control of livestock diseases with traditional knowledge is an old practice in many parts of the world. As per available literature, a total of **169** medicinal plants belongs to **38** families are used in the Shivalik ranges of Uttarakhand to treat livestock. Fabaceae is the most dominant family in the area. The source of plant species was from wild vegetation followed by the home gardens. Herbs are the most frequently used plant species followed by trees. Leaves are the foremost plant material followed by roots. The method of preparation was done through crushing. Mostly the drugs are administered by oral route followed by dermal. A large number of medicinal plants are being threatened by agriculture expansion followed by drought. Medicinal plants sold in the market are not primarily meant for medicinal use rather for other purposes such as food, spices, beverages. Therefore, the objective of this paper is to review traditional veterinary medicinal practices and medicinal plants used by indigenous people.

Keywords: - Ethnoveterinary practices, ethnoveterinary medicinal plants, indigenous knowledge, traditional healers, Uttarakhand

Ethnoveterinary medicine is an interdisciplinary study of the local knowledge and the socio-cultural structures and environment associated with animal health care and husbandry (Tiwari and Pande., 2010). Ethnoveterinary practices is becoming a growing concern in the field of ethnobotany in the West (Lans *et al.*, 2006). Ethnoveterinary medicines are used extensively and quite effectively for primary health care treatment to make domestic animals productive and healthy. India is rich in its tribal population and being agricultural country has rich biodiversity of both flora and fauna (Kirtikar and Basu., 1978). Major portion of this region are mountainous and endowed with a diverse plant health. This region is gifted with a variety of climatic zones, like Sub-tropical and Sub-Temperate in high valleys. In Uttarakhand mostly five tribal groups are found namely Bhotias, Jaunsari, Bhojas, Tharus, and Rajis (Pande *et al.* 2007, Anthwal 2006, Uniyal and Shiva. 2005). It supports about 18,440 species of plants (Kumari *et al.* 2009). Traditional

knowledge is essential for sustaining a healthy interaction between man and nature. (Wath and Jambu. 2014). The indigenous knowledge of veterinary health care system acquired by traditional herbal healers (Pashu Vaidya's) is orally transformed from one generation to other (Phondani *et al.* 2010). The Uttarakhand Himalayan region has a great wealth of traditional medicinal knowledge of medicinal and aromatic plants. Haridwar, Tehri and Pauri has been known as source of variety of shrubs, healing herbs, and other medicinal plants. Geographically Shivalik ranges of Uttarakhand represents enormous diversity of flora and fauna due to variations in topography, altitude and climate. The Himalaya is well known for medicinally important plant species such as kuth, kutki, jatamansi now become endangered due to their over-exploitation and encroachment from their natural wild habitat (Duthie 1911, Badola *et al.* 1968, Adhikari *et al.* 2007). The Indian Himalayan region alone supports about 18,440 species of plants (Angiosperms: 8000 spp., Gymnosperm: 44

spp., Pteridophytes: 600 spp., Bryophytes: 1736 spp., Lichens: 1159 spp. and Fungi: 6900 spp.) of which about 45% are having medicinal properties (Singh *et al.* 2009). In human civilization, domestic animals play a very important role. In addition to humans, for many domestic animals, plants are used as medicine. Among the Shivalik range use of ethnoveterinary medicinal plants for therapeutic practices are very common. They depend on local medicinal plants for the health of their domestic animals because of less availability of modern health care facilities and the insecurity of indigenous people. Medicinal plants are the fundamental natural resources for basic health care, ethnomedicine, and the traditional Indian system of many remedies (Sharma *et al.* 2020, Sharma *et al.* 2021). This research is the first attempt on the local people of Shivalik range to study their indigenous knowledge and assess the conservation status of medicinal plants and herbal remedy practices in the care of their livestock. For quantification of the reported data, well-known statistical indices, the Usage Value formula, and Relative Frequency Citations were used. As per available literature 169 medicinal plants belonging to 38 families have been identified, the most cited being Poaceae. Goats, sheep, buffaloes, cows, bulls and donkeys are common animals. Many of the herbs used in the care of livestock are wild and few plants are cultivated. Red water, 3 days of sickness, diarrhoea, tympany and indigestion among others are the common livestock diseases. *Brassica nigra* was used for placenta retention, according to the findings *Calotropis procera* for indigestion, *Butea monosperma* for constipation. For fever, *Canabis sativa*, *Cedrella serrata*, *Allium sativum*, and *Origanum vulgare* have been used. The ethnobotanical conservation assessment found that 49 percent of these commercially valued medicinal plant species have decreased in the last 30 years due to increased exploitation and unsustainable harvesting. Some of the species, such as *Paeonia emodi* and *Berberis Lycium*, are only present at high altitudes after they have

been completely uprooted in the foothills. Lack of scientific knowledge, ignorance, poverty, and unemployment, as well as the creation of property, buildings, and burning, bring more pressure to the area's flora and fauna, and different species are threatened with extinction (Khan *et al.* 2019). The preparation of herbal medicines remains an important part of health care system for both humans and livestock especially for the small and subsistence farmers who lack access to modern veterinary facilities and are unable to afford synthetic medicine due to their high prices. There is a rich and efficient ethnoveterinary tradition that exists in the villages of India which form integral part of the family and plays an important social, religious and economic role. While ethno-veterinary practices can lead to their validation and eventually to better animal healthcare provision and enhanced living standards of the rural poor (Nyamanga *et al.* 2008 Lans *et al.* 2007). Current study was conducted with the sole purpose of eliciting the precious wealth of information on the ethno-veterinary uses of medicinal plants practices by the local and tribals people of Uttarakhand. The primary and outmost importance of study is to document all collected information in tabulated form by the people for the treatment of various livestock including poultry in different parts of Shivalik range of Uttarakhand. To fulfil the demand of such vast population and to reduce pressure on wild varieties we need cultivated varieties of medicinal plants also. Awareness towards agricultural diversification among native people creates a difference especially in rural areas where people are using the sources unscientifically. In this region, the tribal and other migratory herders and shepherds utilize herbal therapies for treatment of their livestock. Information on these plants used for veterinary practices was obtained through interviews of herders, shepherd etc (Jain *et al.* 2020).

Description of study site: The study is based on the detailed published literature on

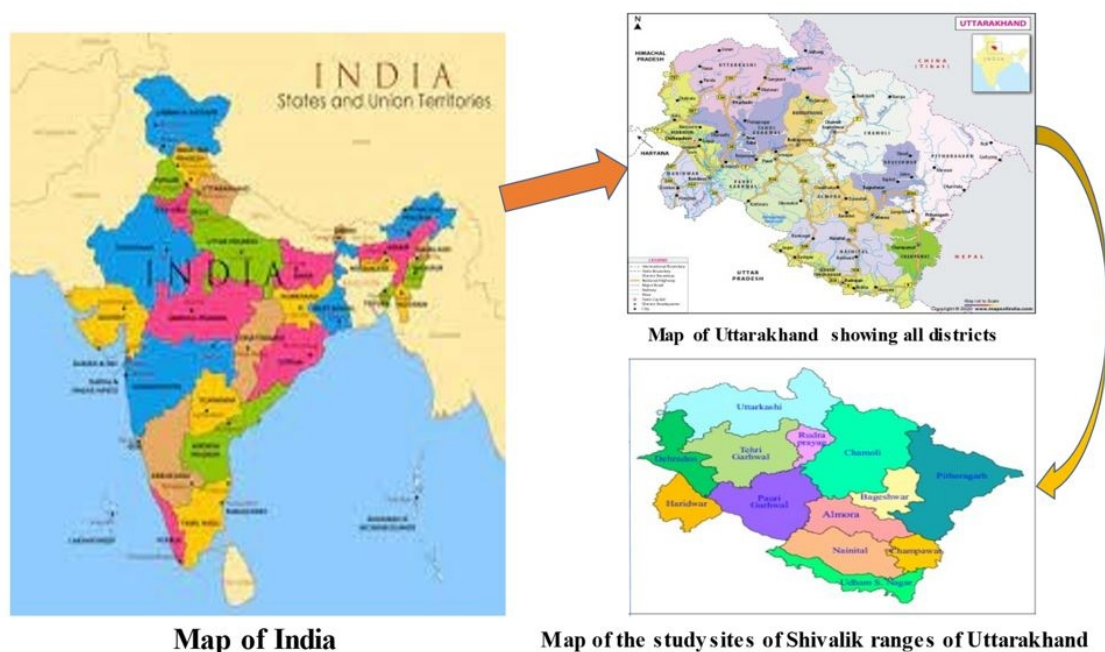


Figure 1: Map of Shivalik ranges of Uttarakhand showing all districts

medicinal plants of Uttarakhand. Uttarakhand also known as 'Herbal State', is a rich source of medicinal plants and traditional medicinal knowledge. It is a hilly state with international boundaries to the north with China (Tibet) and the east with Nepal. Himachal Pradesh is to the north-west, and Uttar Pradesh is to the south. It covers 53,483 square kilometres. This state lies between 28° 53' 24" to 31° 27' 50" N and 77° 34' 27"-81° 02' 22" E. of its total geographical area, about 47, 325 sq. km is covered by mountains (Figure 2). There are Four major river systems viz. Ganga, Yamuna, Ramganga & Sharda originating from the state along with their tributaries which are major source of water for drinking, irrigation and hydropower. The major wealth of the state is its forests with very rich biodiversity. The state ranks sixth among the other states in terms of percentage of recorded forest area. According to Census of India, 2011, Uttarakhand has a total population of 101.17 Lakh with a decadal growth rate of 19.17 percent for the year 2001-11. Out of total population, 51 percent are males while 49 percent. Remote areas of Uttarakhand were surveyed in Literature and ethnoveterinary

practices and information were collected with the help of local medicine men and old experienced people. The surveyed districts were Almora, Pauri, Dehradun, Pithoragarh, Nainital, Bageshwar, Tehri, Rudraprayag and some other hilly areas of Uttarakhand (Pande *et al.* 2007). The present study was documented in order to describe various medicinal plants used to treat livestock utilized as ingredients in many forms of medications and formulations against various diseases in Shivalik regions of Uttarakhand. Medicinal plants that are extensively used as medicines against various diseases were studied and finalized to be included in the present study.

Demographic status: Information of ethnoveterinary medicinal plants was obtained through in-depth direct interview with the Tribals, local healers and field observations. A descriptive statistic was used to analysed the reported ethnoveterinary medicinal plants and associated indigenous knowledge. Preference ranking was used to assess the degree of effectiveness of certain medicinal plants against most prevalent animal diseases in the area (Rohma *et al.* 2015).

Ethnobotanical uses of medicinal plants:

Tribal practitioners employ certain plant components and dosages to treat various ailments. Plant products can be consumed fresh, cooked into a paste or juice, or in the form of a decoction (juice) or an infusion (oral treatment). External use of paste drugs (to treat cuts/ wounds, skin diseases, and fatal bites) was observed regularly. To treat ailments, decoctions, juices, and infusions were administered internally (cold, cough, etc). Fresh leaf, root, and stem preparations were preferred and used more frequently than other plant parts. On the other hand, oral consumption was found to outweigh external application in the vast majority of cases. For topical treatment, the paste formulation was occasionally mixed with oil. Preparations that combine different plants for increased effectiveness. It was also discovered that different parts of the same species of plant are employed to solve different problems. *Butea monosperma* gum, seed, and flowers are used to cure diarrhea. (Bisht and Bhatt 2012, Dar *et al.* 2017).

Traditional preparation and practices: For the creation of various ethnomedicines, traditional healers primarily use leaves (50%) of plants, followed by whole plants (38%) and fruits (12%). According to the current study, leaves (50 percent) are the most commonly collected plant components for therapeutic purposes. This could be owing to the fact that it is readily available and contains a high concentration of substances that can be extracted and used in a variety of ways, although biochemical analysis and pharmaceutical screening are required to double-check the local data. When compared to other components of the plant, such as roots and flowers, the use of leaves has no negative impact on the plant's life cycle. The leaves remain green and numerous for most of the year due to adequate rainfall conditions for around eight months of the year. Traditional healers are involved in the preparation of 110 recipes, with decoction (35%), powdering

(24%), crushing (20%), and extracting juice being the most common modalities of ethnomedicine preparation in the examined region (12%). The most generally used procedures for extracting active chemicals include decoction, grinding or crushing, and boiling. The high use of freshly made ethnomedicines indicates that medicinal plants are abundant in the surrounding areas and can be picked at any time. (Jaiswal and Jain 2017, Kapkoti *et al.* 2014).

Preparation of veterinary herbal medicines:

Herbal medications for animals can be provided or produced in a variety of ways, such as by chopping fresh herbs and mixing them with food. It's possibly the best approach to give herbs when they're in season. Dried herbs can be consumed as is or made into infusions or decoctions by combining them with hot water for internal or exterior usage. Externally, oil infusions or lotions are used, for example, by rubbing on sore joints. Commercially prepared tablets or powders are the most commonly seen forms of herbal remedy. (Rastogi *et al.* 2015).

Mode and route of administration:

Drenching, bathing, and fumigation are all options for administering ethnoveterinary medications. Drenching is the process of administering medication in liquid form through the mouth with the help of a spoon, dropper, or sorghum straw; on the skin, a poultice, soft hot preparation (given to a sore or abscess with a wet cloth), warm stone, or direct application. Fumigation (use of smoke to kill insects); steam (applied to the infected part); hanging bouquet (when pieces of plants are attached to a bouquet and hanged inside a poultry house); in the application doff the eye (medicine is dropped into the bird's eye); and finally, by combining them with medicine, medicine can be applied through feed or water. The oral application was the highest and most frequently used route of application followed by topical and nasal application. The oral route is considered to have a rapid physiological reaction with the causative agents and to

increase the healing power of medicinal plant remedies. Plant materials include seeds, berries, roots, leaves, bark, or flowers used for medicinal value. (Semayat 2017). In the researched location, the majority of plant treatments are taken orally and topically, according to the current study. As previously said, gastrointestinal and skin issues are prevalent in the region, which may explain why the majority of the herbs are utilized orally and topically. Ethnomedicines are taken with a variety of additives known as vectors, such as honey, salt, sugar, milk, desi ghee, and wheat flour, in order to enhance flavour and diminish the astringency of the treatments. (Ahmed *et al.* 2009, Thakur *et al.* 2021).

Data analysis: Descriptive statistical methods, percentages, and frequencies were used to analyze the reported ethnoveterinary medicinal plants data and associated indigenous knowledge. For each category, the informant consensus factor (ICF) was calculated to determine how closely the informants agreed on the claimed cures. This is how the ICF was determined: Number of use citations in each category (nur) minus the number of species used (not), then divided by the total number of use citations in each category minus one (Heinrich *et al.* 1998).

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

The medical plant was thought to be the most effective was given the greatest value, 5, and the one that was seen to be the least successful was given the lowest value, 1. (Martin 1995).

STATISTICAL ANALYSIS

Use Value (U_{vi}): It is calculated by using the formula

$$U_{vi} = 6U_i/N_i$$

U_i = Use reports cited for a particular plant species by each respondent and

N_i = Total informants interviewed for a particular plant species.

Relative frequency of citations (RFCs): RFCs index was used to assess the traditional uses and medicinal value of each species in the area

$$RFCs = FCs/N$$

FCs = No. of local respondents who use the taxa traditionally and *N* is the total number of respondents of in the study.

Indigenous knowledge: It refers to the body of information, rules, standards, abilities, and mental concepts that local people possess (Esmail *et al.* 2012) Medicinal plants and their therapeutic benefits in livestock care are attracting the attention of an increasing number of natural and social scientists, veterinary practitioners, livestock owners, and field workers in developing nations. (MaCorkle 1995, Mathias and McCorkle 2004).

Traditional medicine: It as the sum total of all knowledge and practices used in the diagnosis, prevention, and elimination of physical, mental, or social imbalances, relying solely on practical experience and observation passed down verbally or in writing from generation to generation, whether explicable or not. Folk medicine, ethnomedicine, and indigenous medicine are all terms used to describe this type of health care. (WHO., 2008; Belay and Jarsso., 2016). Because of the small number of conditions mentioned, certain categories were simplified. The following diagram depicts the distribution of conditions within the various pathological groupings (certain illnesses, states, or supplements utilized in livestock management in relation to health have been included in this classification. (Adjanohoun *et al.* 1989).

The role of live stocks to human being:

Demand for animal products in all-region and generally in developing countries is likely to rise significantly because of population growth, urbanization, and rising income in face of relatively low levels of consumption at present. The rise in demand for livestock products has far-reaching ramifications for food security, poverty reduction, and the

Table 1: Ethno-Medicinal Plants used as Veterinary Medicine and their preparation and application methods by the traditional healers in animals in Uttarakhand.

S. No	Botanical Name	Parts Used	Diseases cured	Mode of treatment
1,	<i>Capsella bursapastoris</i> Moench.	Whole plant	Sikka Rog	Two palmful whole plant decoction in water given two times for vigour
2.	<i>Cardamine impatiens</i> Linn	Whole plant	Tantrka in calf	One palmful whole plant decoction in one litre water given two times for vigour
3	<i>Viola biflora</i> Linn	Whole plant	Calf, heart & faint problem	Two palmful whole plant two times a day for attack. Three/four parts of two palmful whole plant & a spoon honey given two times for heart & skin problem.
4	<i>Viola patrinii</i> DC	Root	Liver and Indigestion	Two palmful root decoction in one litre water given two times for vigour.
5	<i>V.serpens</i> Wall.	Root	Liver problems	Two palmful root decoction in one litre water given three times in a week with honey.
6	<i>Hypericum cernum</i>	Whole plant	Hoskins, wound healing	Two palmful whole plant decoction in one litre water given two times for vigour
7	<i>Linum usitatissimum</i> Linn.	Whole plant	Strength	Two palmful whole plant decoction in 1 & 1/4 litre water given two times for strength
8	<i>Melilotus alba</i>	Whole plant	Stomach problem and Indigestion	One palmful whole plant given three times in a day for Vigour
9	<i>Trifolium repens</i> Linn.	Whole plant	Satrika	Four palmful whole plant given two times a day
10	<i>Agrimonia pilosa</i>	Kafliya	Whole plant	Purification of blood half palmful whole plant decoction in three/ four litre water given one fourth part with gur in morning
11	<i>Fragaria vesca</i> Linn.	Kafal	For preventing abortion	Two palmful leaves given daily
12	<i>Potentilla argrophylla</i>	Brajdanti	stomach problem	One palmful leaves/two matured root decoction in 3/4 litre water given thrice in a day.
13	<i>Rhamnus virgata</i> Roxb.	Fruit	In Leg swelling	Five matured fruit decoctions in 1/4 litre water given daily
14	<i>Rosa moschata</i> Herrm.	Fruit	For leukorrhoea, bleeding, Pregnancy termination.	Two palmful fruit with one spoon honey given daily
15	<i>Rubus paniculatus</i> Sm.	Leaf	In pregnancy	Two palmful leaves decoction in 1/2 litre water given its one cup twice a day
16	<i>R. lasiocarpus</i> Sm.	Leaf	In pregnancy	Leaf is useful for cow specially in pregnancy pain
17	<i>Bergenia ciliata</i> Moench.	Root	for Hydrophobia	Two palmful root decoction in 1/2 litre water given its one cup thrice a day
18	<i>Ribes grossularia</i> Linn.	Whole plant	For preventing abortion	One palmful whole plant given daily
19	<i>Punica granatum</i> Linn.	Skull of fruit	As antimicrobials	One palmful skull of fruit decoction in 1/2 litre water given its one cup three times a day with gur
20	<i>Woodfordia floribunda</i>	Dhow Flower	As energy syrup	One palmful dry flower decoction in water is useful for animals
21	<i>Centella asiatica</i> (Linn.) Urban	Leaf	For brain fever	Apply paste of green leaves on forehead during fever
22	<i>Cuminum cyminum</i> L.	Seed	For indigestion	One palmful seed in 1/4 litre water given daily
23	<i>Foeniculum vulgare</i> Mill.	Seed	For Hookworm	One palmful seed in 1/8 litre water given before morning meal
24	<i>Pimpinella diversifolia</i> DC	Seed	For Lactation	One palmful seed given daily
25	<i>Abina cordifolia</i> Hook. F	Bud& leaf	For Wound & fever	Applying paste of new bud on the wound. Decoction of leaves in 1/2 litre water given thrice a day in fever
26	<i>Valeriana hardwichii</i> wall	Root	For Titani	Four matured root decoctions in two litre waters given 1/4 litre twice a day
27	<i>Aesculus indica</i>	Fruit	In stomach problem	One palmful fruit decoction in 1/2 litre water given with gur
28	<i>Artemisia maritime</i> Linn	Bud/Leaf	For Indigestion	One palmful bud/leaves decoction in one litre water given one cup daily.
29	<i>Anilagirica</i> Pampanini Roxb.	Whole Plant	Urinary tract infection	One palmful whole body decoction in one litre water given one cup with gur
30	<i>Artemisia parviflora</i>	Leaf/ Bud	For round worm	One palmful leaves/ bud decoction in a litre water given 1/8 litre in one-hour interval
31	<i>A. sacrorum</i> Ladeb.	Leaf/Bud	For hair fall	One palmful leaves & bud decoction in two litre waters given one cup twice a daily
32	<i>Butea frondosa</i> Koen.	Flower, Seed	As painkiller	Paste of flower and seed is given thrice in 3 days interval.
33	<i>Acacia catechu</i> Wild.	Stem	Urine problem, dysentery	One palmful stem decoction in 1/2 litre water given one cup four times a day.
34	<i>Geranium ocellatum</i> Camb.	Whole plant	As insecticide	Four whole plants with fibrous food twice a day. Powder of whole plant is given as insecticide.
35	<i>Brassica napus</i> Linn.	Kali sarso	Poor appetite	Two palmful seed is given with fibrous food and gur twice a day
36	<i>Fumaria parviflora</i> Lamk.)	Whole plant	Skin (disease) itching	One palmful whole plant decoction in one litre is given

37	<i>Berberis aristata</i> DC	Root & stem	Fever, weakness	One palmful root/ stem decoction in ½ litre water given one cup daily
38	<i>Paeonia emodi</i> Wall.	Root	Stomach problem	One matured root decoction in 3 / 4 litre water is given one cup with 100g gur thrice a day.
39	<i>Aconitum balfouria</i> stapf.	Root	Wound healing	One matured root burn in one litre oil gives an ointment
40	<i>Delphinium denudatum</i> Wall	Munel Seed	Tics	One palmful seed decoction in ½ litre water is given
41	<i>Anemona obtusiloba</i> Don.	Leaf	Sinus	A cotton bud is made of Paste of leaves with Ghee for cleaning sinus.
42	<i>Canna indica</i> Linn.	Root	Disinterest, Afra	Powder of one bunch of roots is given with gur
43	<i>Hedychium spicatum</i> Ham. ex. Smith	Root	Fever & Cough	Root is given with gur and sugar and given thrice in a week.
44	<i>Juglans regia</i> Linn.	Leaf/ fruit	Stomach problem, Joint pain.	Two palmful leaves or two green fruits decoction in 1 litre water is given one cup with two spoon honeys thrice a day
45	<i>Urtica dioica</i> Linn.	Leaf	Skin disease Lactation	One palmful leaves is given with fibrous food in 1hour interval
46	<i>Datura stramonium</i> Linn.	Leaf	Injury, Pain killer	Paste of one palmful leaves acts as ointment
47	<i>Atropa belladonna</i> Linn.	Leaf	Injury as pain killer	Paste of one palmful leaves burns in oil acts as ointment
48	<i>Calendula officinalis</i> Linn.	Leaf	Bleeding	Juice of leaves is helping in bleeding.
49	<i>Tagetes erecta</i> Linn.	Fruit	Vomiting, Wound healing	One palmful fruit is given with fibrous food at the time of vomiting. Its external use is in filling wound
50	<i>Reinwardtia trigyna</i> Planch	Root	Wound healing	One bunch of root decoction in ½ litre water given one cup in a gap of two days
51	<i>Althaea officinalis</i> Linn.	Root	Termination of pregnancy	Three/ four matured root decoction in one litre water is given thrice in a week.
52	<i>Equisetum arvense</i> Linn.	Whole plant	Urinary problem	Half palmful whole plant decoction in one litre water given two times daily for 3 to 5 days.
53	<i>Achyranthes aspera</i> Linn.	Whole plant	Toothache	One palmful whole plant in ½ litre water is useful in teeth problem
54	<i>A. bidentata</i> Blume	Root	Laxative	One palmful root decoction in one litre water given two times for vigour
55	<i>Chenopodium album</i> Linn.	Leaf/ seed	Worm	Two palmful seed is given before breakfast once in a day for three days.
56	<i>Rheum emodi</i> Wall.	Root	Blood purifiers	One matured root decoction in one litre water given three times for vigour.
57	<i>Rumex hastatus</i> D.	Whole plant	Skin disease, Fever	One palmful whole plant decoction in 3 / 4 litre water given one cup thrice a day.
58	<i>Piper longum</i> L.	fruit	Loss of appetite	As oil massage Powder of fruit is useful for low appetite. Oil with powder massage is useful
59	<i>Cinnamomum tamala</i> Ness	Leaf	Stomach problem, Gastric problem	Powder of Leaves and bark with half palmful fibre food is useful.
60	<i>Litsaea polyantha</i> Juss	Leaf	Injury	Powder of bark & leaves in cold water as ointment
61	<i>L. umbrosa</i> Ness.	Leaf	Bone injury	Paste of leaves in water as ointment in bone injury
62	<i>Viscum album</i> Linn	Fruit	Pregnancy problem	Six fruits with milk twice a day for almost two weeks.
63	<i>Emblica officinalis</i> Gaertn	Fruit	Eye diseases	Two palmful fruits powder with fibrous food
64	<i>Euphorbia prolifera.</i>	Fruit	Used in dog bite	Powder of fruit is useful and given one times in three-days interval.
65	<i>Senecio chrysanthemoides</i> DC.	Whole plant	Skin disease	Two palmful whole plant decoction in 3/4 litre water given one cup daily.
66	<i>S. rufinervis</i> DC.	Seed	Wound healing	Three palmful seed given twice a daily.
67	<i>G. pretense</i> Linn.	Whole plant	Fever, urine problem, eye problem	Two palmful whole plant decoction in 3 / 4 litre water given one spoon thrice daily.
68	<i>Tanacetum nubigenum</i> Wall.	Leaf/ Fruit	As energy syrup, anti-microbes	One palmful leaves/ fruit decoction in one litre water given one spoon with honey.
69	<i>Lobelia pyramidalis</i> Wall.	Whole Plant	Liver disease	Two palmful whole body decoction in 3 / 4 litre water given one spoon with honey thrice a daily.
70	<i>Anagallis arvensis</i> Linn	Fruit/Leaf	Pain killer	Two palmful fruit/ leaves given daily.
71	<i>Primula denticulate</i>	Fruit	Mammary glands	Two palmful flower given with gur for two to three days.
72	<i>P. macrophylla</i>	Whole Plant	Painkiller	This plant works as painkiller and given 2 times daily for 3 days.
73	<i>Holarrhena antidysenterica</i>	Seed & bark	Fever, Gastric & dysentery	One palmful powder of bark/ seed decoction in one litre water given one cup with gur.
74	<i>Calotropis procera</i>	Root	Indigestion	One palmful powder of root decoction in one litre water given one cup twice a day.
75	<i>Gentiana tenella</i> (Roxb) H. Smith.	Fruit	Hysteria, In weakness	25g of bark of fruits decoction in one litre water given one cup with honey per day.
76	<i>Swertia purpurascens</i> Wall.	Whole Plant	Weakness loss of appetite	Two palmful whole plant decoction in one litre water given one cup thrice a day

77	<i>Capsicum annum</i> Linn.	Fruit	Fever	One palmful fruit decoction in three litre water gives one cup twice a day.
78	<i>Datura metal</i> Linn.	Seed	Pain killer	25g roasted seed in one litre oil is used for massage. (For external use only).
79	<i>Hyoscyamus niger</i> Linn.	Seed	Pain killer	Paste of leaves and seed is used as ointment.
80	<i>Digitalis purpurea</i> Linn.	Leaf	Burning	One palmful leaves is roast with oil is used as ointment and given 2 times a day.
81	<i>Verbascum thapsus</i> Linn.	Leaf	In bronchitis	One palmful leaves decoction in 3/4 litre water given one cup thrice a day.
82	<i>Clerodendrum infortunatum</i>	Bark	Afra	Powdered bark decoction in two litre waters given one cup thrice a day.
83	<i>Ajuga parviflora</i> Benth.	Whole plant	Arthritis	One palmful whole plant decoction is given twice a day for four days.
84	<i>Mentha arvensis</i> Linn.	Whole plant	Post pregnancy problems	Two palmful whole plant decoction in a litre water given ¼ part thrice a day.
85	<i>Ocimum sanctum</i> Linn	Whole plant	Fever	Two palmful whole plant given twice a day.
86	<i>Origanum vulgare</i> Linn.	Whole plant	Indigestion	Four palmful whole plant with fibrous food twice a day.
87	<i>Salvia lanata</i> Roxb.	Whole plant	Vomiting, painkiller	Two palmful whole plant with gur and fibrous food thrice a day
88	<i>Scutellaria angulosa</i> Benth.	Whole plant	Acidity	One palmful whole plant decoction in ½ litre water given one spoon with honey thrice a day.
89	<i>Thymus serpyllum</i> Linn.	Whole plant	Chest pain	One palmful whole plant decoction in ½ litre water given one cup twice a day.
90	<i>Plantago major</i> Linn.	Leaf	Injury, teeth problem, fever	Paste of leaves in water useful for injury & teeth pain. Two bunch of leaves decoction in one litre water given 1/6 part thrice a day for fever.
91	<i>P. orata</i> , Forsk.	Seed	Dysentery	One palmful seed in ½ litre water makes a semisolid paste given thrice a day.
92	<i>Boerhaavia diffusa</i> . Linn	Leaf	Blood dysentery	dropsy Juice of leaves thrice a day.
93	<i>Euphorbia prolifera</i> , Buch. Ham., ex. Don.	Fruit	Used in dog bite	Powder of fruit is useful given once in a day.
94	<i>Mallotus philippinensis</i>	Fruit	To protect from worm	Fruit extract with one palmful fibrous food is given once a day.
95	<i>Ricinus communis</i> Linn.	Leaf	Internal injury	Oil of this plant is useful. Use of leaves in heat therapy.
96	<i>Betula utilis</i> Don.	Seed	To protect from worm	Two small pinches are useful and given daily for 2, 3 days.
97	<i>Quercus dilatata</i> Lindl.	Bark	Dysentery	Two palmful powder of bark decoction in one litre water given one cup twice a day.
98	<i>Q. semecarpifolia</i> Sm.	Bark	Dysentery	Two palmful bark powder decoction in one cup water given twice a day.
99	<i>Salix elegans</i> Wall.	Fruit	Rickets	Three palmful fruits decoction in one litre water given one cup thrice a day.
100	<i>Ephedra gerardiana</i> Wall.	Stem	Pain	One bunch of stem pieces decoction in 2 litre waters given one cup in early morning
101	<i>Juniperus communis</i> Linn.	Fruit	Liver disease	Twelve fruits given daily for one week with proper precautions.
102	<i>Abies webbiana</i> Lindl.	Bud	Cough	One palmful bud decoction in 3 litre waters given thrice a day
103	<i>Cassoa absus</i> Linn.	Seed	Urine problem	One palmful seeds decoction in ½ litre water given one cup thrice a day
104	<i>Satyrium nepalense</i> D. Don.	Root	As tonic	Two palmful roots decoction in 3 / 4 litre water given ½ parts twice a day

105	<i>Zingiber officinalis</i>	Root	Internal injury as anti-worm	Paste of root is given daily for one weeks.
106	<i>Cureuma angustifolia</i> Roxb.	Root	Gastric problem anti worm	Paste of root is useful and given 2 to 3 times for one week.
107	<i>Acorus calamus</i>	Root	Fever, pain	Two matured roots with fibrous food given daily
108	<i>Allium stracheyi</i> Baker.	Whole Plant	Stomach problem	Two palmful whole plant given thrice a day
109	<i>Allium wallichii</i>	Root	Infection	Two nodes given daily to cure infection
110	<i>Aloe barbadensis</i> Linn.	Leaf	Stomach problem	Juice of leaves given ½ cup a day
111	<i>Adiantum venustum</i> G. Don.	Seed	Chest problem and hair fall	One palmful seed given with fibrous food
112	<i>Terminalia bellirica</i>	Fruit	Diarrhoea	Five to six fruits are given twice a day for 2 days.

Abbreviations: - H=Herb; T=Tree, S=Shrub, C=Climber, T= Tendrils. (Table source: - Pande et al. 2007, Singh et al. 2009)

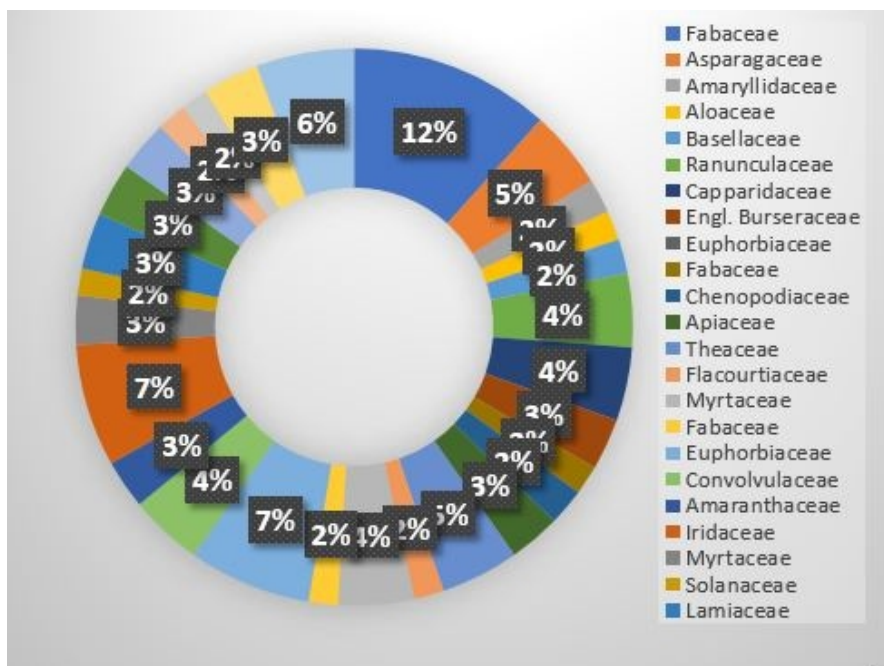


Figure 2: Families representing genera used for their medicinal purpose against various diseases based on data given in table 2.

environment. Increased livestock production, in fact, contributes to improving food and poverty alleviation in developing countries in several ways. Animals can offer us meals, milk, wool, hide, hair, bones, dung, financial instruments, drafting purposes, entertainment, or sport, and many animals have been man's finest friends in combat and used for travel. Animals are also used as tools, such as dogs, which have a high sense of hearing and smell

and are used for drug detection. (Menegesha 2020).

Special care (parhez): Most plants are used in a fresh state, and some plants are at the top of the mountains that are used in a dry state and cannot be collected immediately. Furthermore, the bulk of these plants are not available on the market. In the treatment process, plants are often provided individually and typically there

Table - 2: Plant species their Botanical name, Family, Habitat, Part used and preparation, route of administration, dosage, Diseases treated and species of animals.

S. No	Botanical name	Family	Habitat	Part used	Preparation, route of administration, dosage	Diseases treated & Species of Animals
1	<i>Albezia anthelimentica</i>	Fabaceae	T	Bark	Oral intake. Chew up the fresh bark of the root of the plant by the local healer and then spit to the mouth of the animal about 1 teaspoonful, every day for 2 days.	Internal parasite except Ruminants
2	<i>Asparagus africanus</i> Lam.	Asparagaceae	S	Bark	Oral intake. Bark of <i>Olea eurrepa</i> sub spp. Cuspidate+root of <i>Asparagus africanus</i> should be dried, pounded and mixed together then add 1 cork of the mixture to 1 L of water, given orally 1 L/day for 2 or 3 days	Blackleg, pneumonia, and bloat in Cattle
3	<i>Allium sativum</i> L.	Amaryllidaceae	H	Bulb	Oral and nose. After pounding the bulb, add water, and filter then give through mouth and nose	Mastitis, diarrhoea, internal parasite, and Cattle.
4	<i>Aloe scundiflora</i>	Aloaceae	H	Sap	The sap of the plant is applied into the eye for 3 days.	Eye disease Ruminant chicken
5	<i>Basella alba</i> L.	Basellaceae	H	Whole plant	The fresh vegetative part of <i>Basella alba</i> and flower of <i>Acemella caulirhiza</i> are pounded, mixed together, squeezed and given 3 times/day until recovering.	Bloat Eye problem Topically wound Cattle, sheep, goat, and equine.
6	<i>Clematis hirsuta</i> Perro and Guill Galeb	Ranunculaceae	C	leaf	Pound the fresh leaf to make paste and apply once	All animals
7	<i>Cleome gynandra</i> L.	Capparidaceae	H	Leaf	Five spoonful fresh ground leaf and vegetative parts add to 1 cup of water and given 1 cup through nose for 3 days, daily	Hepatitis Cattle
8	<i>Comiphora erythraea</i> (Ehrenb.)	Engl. Burseraceae	T	Whole plant	Mix the sap of the plant with water and applied for 3 days, daily external parasites.	All animals
9	<i>Croton macrostachyus</i>	Euphorbiaceae	T	Leaves	fresh leaves crushed and mix with water and given orally 4 cup/day	Diarrhoea (dysentery), external parasite Cattle
10	<i>Calpurnia aurea</i> Benth.	Fabaceae	S	Leaves	Add about one cup of water to the ground fresh leaf and given orally and topically once/day for 2 days: 100 ml - cattle 50 ml - goat and sheep	Internal and external parasite Cattle goat and sheep
11	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	H	Fresh leaves	After grinding the fresh leaf, mix with water to prepare (liquid) 1 L then it is given orally once	Mastitis Cattle
12	<i>Centella asiatica</i> (L.) Urban	Apiaceae	H	Leaf	Pound the fresh leaf, mixed with little water to prepare the paste then it is applied topically once	Itching Sheep
13	<i>Camellia sinensis</i>	Theaceae	S	Fresh leaves	After drying and crushing the fresh leaves of <i>Camellia sinensis</i> and <i>Nicotiana tabacum</i> mixed with water to make paste then apply topically once	External parasites Cattle goat and sheep.
14	<i>Dovyalis abyssinica</i>	Flacourtiaceae	T	Bark	The outer part of the fresh bark is removed and pounded then add about ½ kg to 1 L of water and administered orally 1 L/day for 2 days	Diarrhoea Cattle
15	<i>Ecalyptus camaldulensis</i>	Myrtaceae	T	Bark	Bark of <i>Olea eurrepa</i> sub spp. Cuspidate root of <i>Asparagus africanus</i> + non bursting seed of <i>Eucalyptus camaldunesis</i> should be dried, pounded and mixed together then add 1 cork of the mixture to 1 L of water, administered orally 1 L/day for 2 or 3 days.	Blackleg, pneumonia, and bloat Cattle
16	<i>Erythrina brucei</i>	Fabaceae	T	Fresh leaves	The fresh leaf is pounded and add 1 cup of water. It is given 1 cup per day orally for 3 days applied topically	Internal parasite External parasite Ruminants
17	<i>Euphorbia schizacantha</i>	Euphorbiaceae	H	Root and Leaves	Pound the fresh root then adds enough water and given considerable amount orally.	Anthrax Cattle, sheep, goat and equine.
18	<i>Ipomoea kituensis</i>	Convolvulaceae	C		The dried root pounded, 1/2-1 teaspoonful powder is added to 1 tea cup water and administered orally daily and topical application 2 days interval for 3 days.	Rectum prolapse Cattle, sheep goat, and equine
19	<i>Iresine herbstii</i> Lindl.	Amaranthaceae	H	Fresh Leaves.	Pound the fresh leaf, mix with water to prepare 1 L (liquid) then it is administered orally once	Trypanosomiasis Cattle

20	<i>Lapeirousia schimperi</i>	Iridaceae	H	Fresh bulb, Root	The local healer chews the fresh bulb (root) and spit to the nose of the animal immediately after biting, and the dose is probably 1 teaspoon	Snake bite Ruminants Equine
21	<i>Myrtus communis</i> L.	Myrtaceae	T	Whole plant	pounded the fresh vegetative part of the leaf and after squeezing and filtering, add 4 teaspoonfuls of the filtration to 1 cup of water and administered orally 1 cup for 2 days, daily; morning and evening	Ruminant and equine except camel Hepatitis
22	<i>Nicotiana tabacum</i> L.	Solanaceae	H	Fresh Leaves	The fresh leaves of <i>Maesa lanceolata</i> and <i>Nicotiana tabacum</i> are pounded together, add water and filter then 1cc is administered through nose for 2 days	Leech Cattle
23	<i>Ocimum lamifolium</i>	Lamiaceae	H	Whole part	the fresh whole part (especially vegetative part) is pounded, add about 20 g to 2 L of water, about 1 L is administered orally per day for 3 days	Diarrhoea Cattle
24	<i>Ricinus communis</i> L.	Euphorbiaceae	S	Fresh leaves	Pound about 50 g of fresh leaf and mix with 1 L of water then administered orally 1 L/day (every morning) for 2 days	Mastitis and poor mothering Cow
25	<i>Withania somnifera</i> (L.)	Solanaceae	S	Roots	After drying the roots of both <i>Solanum incanum</i> and <i>Withania somnifera</i> plants, pounded, mixed one teaspoonful from each plant and add water to make solution; 1 teaspoonful of the mixture is given as a drink for three days daily	Most diseases especially anthrax and 3-day sickness but wound Cattle, sheep, goat and equine
26	<i>Zaleya pentandra</i> (L.)	Amaryllidaceae	H	Fresh root	After pounding the fresh root and bulb mix with clean water and administered through nose for 2 days	Nasal bot ovine Foot and Mouth diseases, Intestinal worms,

Table source (Rohma *et al.*, 2015)

Table 3: Chemical compounds present in some plant species used by local respondents of Uttarakhand

Name of Plant species	Chemical compounds
<i>Aesculus indica</i>	Aesin, decanoic acid, quercitin, saponins
<i>Berberis lycium</i>	Berberine, berbamine, punjabine
<i>Cannabis sativa</i>	Cannabigerol, cannabidiol
<i>Grewia optiva</i>	Grewialin, optivanin
<i>Indigofera heterantha</i>	Lactone, flavonides, glycosides, saponins
<i>Ficus carica</i>	Cyaniding, furanoid, cinnamic alcohol, eugenol, flavanols, ficusin
<i>Zanthoxylum armatum</i>	Linalool, palmitoleic acid
<i>Verbascum thapsus</i>	Aucubin, flavonoids saikogenin, saponins

is no special care, although few plants require special care, locally called 'parhez.' The frequent livestock disorders are red water, 3 days sickness, diarrhoea, tympany, and indigestion, and the effects of all of these treatments are usually swift. (Khan *et al.* 2019).

Medicinal plant species used against various livestock ailments and diseases: It was also revealed that the people of Uttarakhand have a very rich traditional herbal medicinal system providing primary healthcare and treatment to their livestock for a long period. The people of this region have full

faith in their old treatise and traditions. The therapeutic herbs utilized by indigenous livestock caretakers in the Garhwal region are tabulated using first-hand information. Some important plants used in ethno-veterinary practices are given in Table 1. Old people, both men, and women are curators of ethnoveterinary practices, which they pass on to the younger generation through oral suggestions. (Singh *et al.* 2008). The use of traditional medicine is widespread in this region with a higher percentage of the population relying on it. This is due to the non-availability of modern medical facilities available particularly in the hilly terrain of the Garhwal region and the expensive modern medicine system cannot be afforded by people of this region (Bhatt and Agarwal. 2018).

Medicinal plant species used for chick productivity: It was observed that large numbers of medicinal plants found in the study area also enhance chicken productivity (Table 2). One or more of the biological effects of these plants appear to promote egg and poultry

Table 3: Details of animal disease and Ethnoveterinary medicinal plants used in the traditional practice followed by the villagers of Uttarakhand

S. No	Name of ailments	Local names	Symptoms	Affected animals	Plant species used	Use pattern
1	worm on wounds	Ghaw per keere padna	Simmering worms inside the wounds	Buffalo, Cow, Oxen, Horse, Mule, Sheep, Goat	<i>Prunus persica</i> (Aaru-Rosaceae)	Leaf paste is externally used to cure germs on wounds.
2	Wounds on back.	Peeth per phodae hona	Wounds and boils on the back	Horse, Mule	<i>Brassica campestris</i>	Oil is used externally on wounds two times daily for one weeks
3	Glactagogue/ Lactation problems	Du dh na nikalna	Drying up of milk gland	Buffalo, Cow, Sheep, Goat	<i>Grevia optiva</i> (Bheemal-Tiliaceae)	Fresh green leaves are directly applied to cure galactagogue
4	Skin disease	Makku	Itching and hair loss of the skin	Goat Sheep	<i>Cedrus deodara</i> Deodar-Pinaceae)	Oil is obtained from the bark and rubbed on the skin once in a day for one week to complete relief against skin infection.
5	Vomiting	Ulti Oozing	waste material from the mouth	Dog, Cat	<i>Hordeum vulgare</i>	Fresh green leaves are directly applied to cure vomiting.
6	Acidity	Gas badhasm	Foul smell	Horse, Mule Oxen,	<i>Angelica glauca</i> (Choru-Apiaceae)	Root's powder mixed with tea and used to drink to cure acidity
7	Diphtheria	Kand Rohni	Infection of the throat	Cow, Oxen	<i>Ficus religiosa</i>	Rhizome of <i>Zingiber officinale</i> and leaves of <i>Ficus religiosa</i> is given with water.
8	Snake bite	sanp dans	Bleeding and swelling on the bitten part	Buffalo, Cow, Oxen, Sheep and Goat	<i>Allium sativum</i> (Lahsun-Liliaceae)	Milled the leaves of <i>Allium sativum</i> and <i>Azadirachta indica</i> and juice is applied to drink with water.
9	Cough Buffalo,	Khansi	Frequent coughing	Cow, Oxen, Sheep, Goat, Horse, Mule, Dog	<i>Dendrocalamus strictus</i> (Banss-Poaceae)	Green leaves of <i>Dendrocalamus strictus</i> grind with seeds of <i>Hordeum vulgare</i> and used to eat.
10.	Dermatitis	Damri	White patches and hair loss from the skin	Buffalo and Horse	<i>Stephania glabra</i> (Gindaru-Menispermaceae)	Grind of <i>Stephania glabra</i> and used to eat with water.
11.	Cataract	Phula	White rashes on the surface of eye ball	Buffalo, Cow, Oxen, Sheep, Goat, Horse, Mule, Dog, Cat	<i>Berberis aristata</i> (Kinmor-Berberidaceae)	Root decoction (juice) and few drops applied to cure eye infection
13.	Arthritis	Jod dard	Swelling in the joints and hamstrung mussels	Buffalo, Cow, Oxen, Sheep, Horse, Mule	<i>Calotropis procera</i> (Aak-Asclepiadaceae)	Leaves of <i>Calotropis procera</i> and bulb of <i>Allium sativum</i> fried with mustard oil and rubbed on infected part.
14	Pneumoniae	Garmi bukhar	Increase body temperature and running nose Dog	Buffalo, Cow, Oxen, Sheep, Goat,	<i>Trigonella foenum</i> (Methi-Fabaceae)	Seeds of <i>Trachyspermum ammi</i> , Rhizome of <i>Curcuma domestica</i> , Leaves of <i>Trigonella foenum</i> and <i>Dendrocalamus strictus</i> grind and mixed with <i>Piper nigrum</i> and used to eat with water
15.	Burning	Jalna Burns	Burns on the skin	Buffalo, Cow, Oxen, Sheep, Goat, Horse, Mule, Dog, Cat	<i>Triticum aestivum</i> (Gehu-Poaceae)	Seeds are grinding and make a paste used externally
16.	Sprain,	Moch aana	Sprain on the foot	Buffalo Cow, Oxen Sheep Goat, Horse,	<i>Urtica parviflora</i> (Kandali-Urticaceae)	Fresh leaves are rubbed on the infected part.
17.	Dysentery	Peichis	Frequent loose motion	Buffalo, Cow, Oxen, Sheep, Goat, Dog	<i>Glycine max</i> (Bhatt-Fabaceae).	Seeds of <i>Glycine max</i> is milled and used to eat with water
18.	Lice and Ticks	Joon padna	Itching on the skin	Buffalo, Sheep, Goat, Dog,	<i>Artemisia nilagirica</i>	Milled the leaves and juice is applied externally
19.	Endo parasite	Peat main keera	Discharge of worms in the dung	Buffalo, Cow, Oxen	<i>Asculus indica</i> (Panger-Hippocastanaceae)	Mature fruit is filled with water and apply to drink.
20.	Sterility	Banjhpan	Obesity and eccentric behave	Buffalo, Cow, Goat, Sheep	<i>Hordeum vulgare</i> (Jau-Poaceae)	Seeds are milled of <i>Hordeum vulgare</i> and <i>Triticum aestivum</i> with <i>Trigonella foenum</i> and make a powder is used to eat with water.
21.	Uterus disorder.	Jair	Placenta membrane is held up inside the womb	Buffalo	<i>Myrica esculenta</i> (Kafal-Myricaceae)	Bark boiled with water and used externally
22.	Bone fracture	Hadi tootna	Swelling on the fracture part	Buffalo, Cow, Oxen, Sheep, Goat, Horse, Mule, Dog, Cat	<i>Vanda testacea</i> (Laguli-Orchidaceae).	Grind the leaves to make a paste and apply on fractured part. The fractured part is supported by <i>Dendro calamus strictus</i>
23.	Broken horns	Seeng tootna	Shelling off outer layer of horn concomitant	Buffalo, Cow, Oxen, Sheep,	<i>Tagetes erectus</i> (Genda-Asteraceae)	Milled the fresh leaves and juice is applied externally

24	Constipation	Kabz	----	All animals	Adrak (<i>Zingiber officiale Rosc</i>). Saunth powder	Adrak paste is mixed with Kamet and given to animal with Chanchh.
25	Carbuncle/Pimple	Phode niklna	----	All animals	Chalmora (<i>Oxalis corniculata</i> Linn.	Paste prepared is applied externally on the pimples.
26	Eczema/ Scabies	Lut	Blisters on skin, falling of hair and itching.	Buffaloes, Cow, Horses etc.	Tambaku (Nicotiana tabacum Linn.)	Crushed leaves of Tambaku are rubbed on affected areas of the animal.
27	For Strength		----	All animals	(Glycine spp.) <i>Stephania glabra</i> (Roxb). Miers	Thick paste prepared from seed of Soyabean Crushed roots of Ganjaru also given.
28	Haematuria	Blood in urine	----	Buffaloes, Cow, Goat etc	<i>Hordeum vulgare</i> Linn. <i>Cucurbita maxima</i> Duch.	A mixture of wheat flour and sugar is given twice a day for one weeks.
29	Hoof diseases	Khuriya	----	Cow and Goat	Kala jeera (<i>Carum carvi</i> Linn). dried ginger and (<i>Glycrriha glabra</i> Linn.)	Red mud is applied on the cleft of foot. Kala zeera, Saunth and mulethi made into powder and mixed with churned curd is given to animals once in a day for three weeks.
30	Paralysis	Ragad	----	Applies to all animals.	<i>Asafoetida ferula</i> Heeng	Heeng powder is mixed with til oil massaged on affected parts of the body. Shimal's bark made into paste mixed with Sira is plastered around the affected part of the animals and bandaged.
31	Stomachache	-	-	All animals	(<i>Canabis sativa</i> Linn).	10-20 gm of sulpha mixed with 10ml water is given to the animal.

Table source: - (Phondani *et al.*: Tiwari and Pande., 2004).

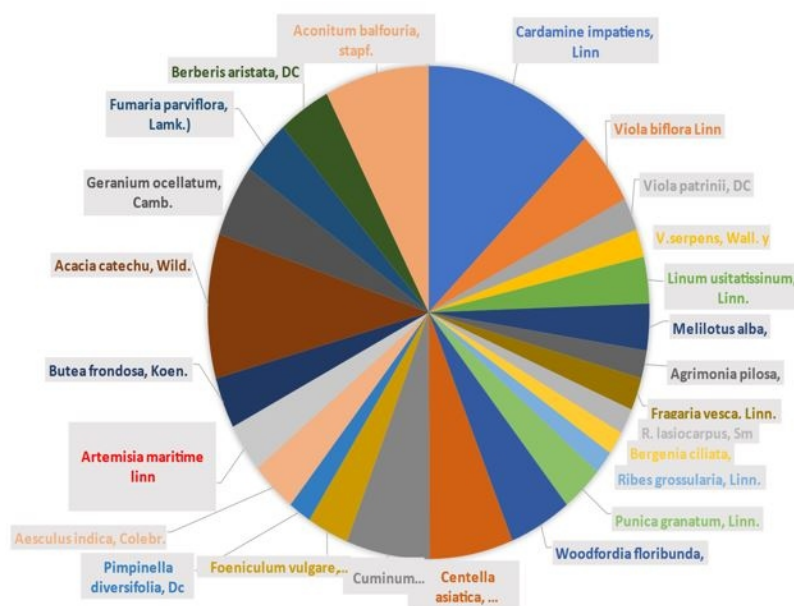


Figure 3: Frequency and percentage of medicinal plants utilized in the preparation of herbal formulations used for various diseases.

function. Improve digestive function feed utilization and feed conversion efficiency and provide nutrients. Reduce or prevent pro catabolic effects of stress. These plants may be broadly categorized as feed additives, anti-stress agents, repartitioning agents, egg

productivity promotions and possess Immuno-modulatory effects (Zafar 1994).

Dynamics of traditional information: According to a comprehensive review of the literature, older individuals are more knowledgeable about the use of medicinal

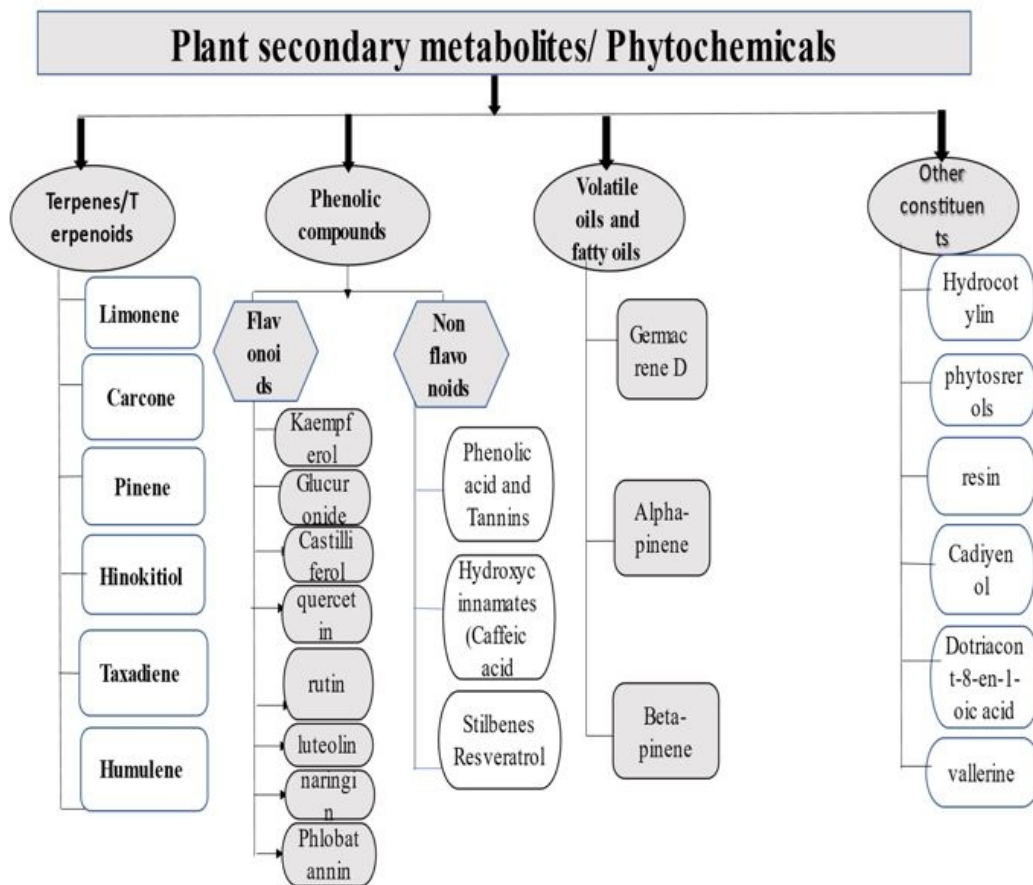


Figure 4: Major classes of Phytochemicals and plant secondary metabolites

herbs than younger generations. Also, as a result of modernization and the migration of people to cities, local or regional languages have declined, which has had a bigger impact on traditional information. Males were shown to have a greater understanding of ethnomedicine than females. It's possible that the reason why men have more indigenous knowledge than women is that men are frequently given priority in knowledge shifts. Women, on the other hand, are often held responsible for the health of their families in various cultures. Because the residents of the study area have a low literacy rate, they are significantly reliant on medicinal plants for a number of uses in order to supplement their income and healthcare system. Due to modernity, the traditional knowledge system is in jeopardy due to the loss of regional languages and a lack of interest among the

younger population. (Sharma *et al.* 2020).

Findings: According to the above-mentioned search strategy and selection criteria, firstly 368 search results were identified through various sources via electronic databases and reviewed based on the title and abstract. A complete list of 167 medicinal and aromatic plants which are used to treat livestock against various diseases was included and complete details such as Botanical name, Local name, part used, and mode of treatment, etc. were noted.

The most frequently reported plant species used for ethno-veterinary practices were *Allium sativum*, *Trachyspermum amni Sprague*, *Brassica campestris*, *Eclipta prostrata*, *Cedrus deodara*, *Zea mays*, *Vitex negundo*, *Prunus persica*, *Daphne mucronata* and *Zingiber zerumbet*. Seeds leaves, root,

bark, bulb, oil extract, fruit and rhizome were the frequently used parts of the plants. Ethnoveterinary prescriptions were commonly prepared by grinding, crushing, preparing the decoction in water or any vegetable oil (preferably *Brassica campestris* oil and mixing the ingredients as such. The commonly used modes of administration were feeding, drenching and tropical application.

CONCLUSION

The present study recognizes that medicinal plants are of great significance for overall health issues within the life of the rural population of the Uttarakhand forested hills. However, these rural communities lack technical knowledge of the therapeutic plants' uses and scope. Various strategies have been undertaken in this field by the central and state governments to increase rural community engagement. However no significant reach of such endeavours was noted in the villages, and thus, the economic potential of medicinal plants remains uncashed in rural life. The same applies to the loss of biodiversity, as villagers were aware of forest protection and biodiversity loss but no ground practice in this direction was observed in any of the villages. Cultivation of medicinal plants must be popularized among farmers while providing more developed technical support and relevant information. Well-structured management of the medicinal plants is highly desired to enhance the income of farmers while checking biodiversity loss in natural habitats. The study suggests that there is a vast amount of indigenous knowledge on ethnoveterinary medicinal plants and this knowledge plays an important role in the treatment of different animal ailments in the districts of Uttarakhand. The authors are gratefully acknowledged to the Department of Botany and Microbiology, Gurukula Kangri (Deemed to be University) Haridwar, Uttarakhand, India for facilities and support.

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