Plant-based veterinary practices in Jammu and Kashmir: A review of the trends, transfer and conservation of traditional ethnoveterinary knowledge

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Review

Abstract

Background: Traditional veterinary phytotherapy refers to the use of plants for promoting health and curing diseases of livestock. Animal rearing is the major occupation of the tribal communities in Jammu and Kashmir and is thus an important part of their economy. Due to the inaccessibility of modern facilities and allopathic drugs, these communities mainly rely on the local flora to cure common ailments prevalent in livestock, developing a rich knowledge of ethnoveterinary practices. These practices are still prevalent despite the advent of modern allopathic drugs as they are easily accessible, effective, and economic. To date, a plethora of studies have been carried out on ethnoveterinary plants in different regions of India, however few of these are available in Jammu and Kashmir itself. The aim of this review was to collate and analyze the traditional phyto-remedies against livestock ailments in Jammu and Kashmir.

Methods: An extensive review of the published literature was carried out using various online databases like Academia, Google Scholar, PubMed, Researchgate, Sci-Finder, Scopus, Science direct, and other allied published literature.

Results: A total of 18 research articles from the year 1989-2021 were selected which were exclusively related to the ethnoveterinary importance of plants. It was found that Jammu province was explored more as compared to Kashmir, as 10 studies were exclusively done from Jammu province and major attention was given to the ailments of cattle, sheep, and goats.

Conclusion: The present review indicates that the medicinal plants reported need detailed biochemical assays to ascertain their therapeutical profiles that can contribute to the discovery of novel compounds to the existing drug pool. The integration of the reported plants into the biodiversity registers and promotion of this traditional heritage by the concerned government institutions and stakeholders involved in conservation is the utmost need of the hour which will ultimately result in the conservation of both the traditional knowledge and biodiversity.

Keywords: Ethnoveterinary, Jammu and Kashmir, tribal, livestock, phyto-remedies

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Background

Veterinary medicine is the science that deals with the prevention, treatment, or mitigation of disease and injury in animals, especially the domestic animals. Ethnoveterinary medicine is an offshoot of ethnobotany associated with the usage of traditional methods of medication of animals (Dutta *et al.* 2021a, Singh *et al.* 2021). Due to insufficient or limited accessibility of allopathic medicine in several parts of the country, most livestock holders and farmers are still using the ancient plant-based traditional knowledge for the treatment of livestock ailments (Bhat *et al.* 2021). In the middle of the 20th century, indigenous use of plants to cure different health issues was said to have been reduced approximately by one-fourth because of the advancement of synthetic drugs (Khan *et al.* 2019). However, today ethnoveterinary medicine still stands out as alternative to western medicinal systems. The maintenance of ethnoveterinary practices, apart from easier accessibility, can be associated with the fact that such practices often have lesser side-effects compared to modern drugs and medicines (Dutta *et al.* 2021b). Accepting and promoting the notion of ethnoveterinary medicine and indigenous knowledge doesn't mean to discourage the importance and benefits of allopathic medicine, nor does it aim to replace it. It just provides an economically as well as culturally sustainable alternative by optimizing the use of traditional yet effective healthcare practices. With the increase in demand for organic farming products and controlled use of synthetic antimicrobials as growth promoters in the plant, ethnoveterinary medicine is the pre-eminent and fitting alternative approach (McGaw *et al.* 2020). Almost all plant parts possessing healing properties are utilized as ingredients in the preparation of ethnoveterinary medicine. The remedial properties are due to the manifestation of a considerable range of biologically active compounds, both primary and secondary metabolites. The ethnoveterinary knowledge for treatment, improvement and maintenance of livestock keeps on refining generation after generation and also varies from one place to another. Thus, this verbal knowledge is cost-effective, dynamic and widely accepted. According to the World Health Organization, approximately 80% people in developing countries are dependent on traditional practices for the management and treatment of diseases affecting humans and animals (Balaji & Chakravarthi 2010). Apart from having knowledge regarding the phyto-therapeutic components or chemical constituents of plants, ethnoveterinary knowledge also encompasses applied skills like harvesting or cultivating, ecological knowledge, understanding of local climate (ethnoclimatology) and know-how regarding the feeding habits of the animals, etc. (Wanzala *et al.* 2005). Hence, documentation of this fragile and rich oral knowledge is necessary so that it doesn't distort or disappear.

Materials and Methods

The present study was based on the systematic review of published ethnoveterinary field studies conducted in Jammu and Kashmir Union territory (J&K) between 1989-2021. The data was retrieved through various scientific online databases *viz.,* Academia, Google Scholar, PubMed, Researchgate, Sci-Finder, Scopus, Science direct and other sources using keywords like ethnomedicinal, ethnoveterinary, traditional medicine for livestock, ethnoveterinary studies in Jammu and Kashmir, Jammu, Srinagar, Poonch, Rajouri, Kishtwar, Kathua, etc. A total of 18 research publications were selected for the review based on their relevance in accordance with the present study. Out of 18 studies, 10 were from Jammu province, 6 from Kashmir province and 2 from whole Union territory. Important information from the studies like plant name, local name, part used, usage form, mode of administration, diseases treated, and location were collected. For taxonomic correction and name authentication of plant species, Plants of the World Online (powo.science.kew.org) was referred.

Results and Discussion

Diversity of ethnoveterinary studies

A total of 18 published articles based on traditional ethnoveterinary medicines (TEVM) from Jammu and Kashmir were selected for review. It was observed that out of 18 studies, 13 (72.2%) were carried out in the past 10 years which attributes to the increasing interest of researchers in TEVM. It was seen that Jammu province was explored more as compared to Kashmir province as 10 studies were exclusively from Jammu province. In terms of districts, Poonch district represented the best-studied area as it contributes 27.7% of the total published articles. The high representation of district Poonch may be a fact of the particularly high biodiversity in the region (Dutta *et al.* 2021a).

Plant diversity

Plants from all the published studies were checked and their botanical names were arranged alphabetically along with families, local names (Dogri, Gojri, Kashmiri, Pahari), part used, usage form, mode of administration, disease, and citation. A total of 247 plant species distributed among 83 families were recorded which are used by the ethnic communities of Jammu and Kashmir to treat several diseases and disorders prevalent in livestock (Table 1).

Table 1. List of plants used against livestock diseases with references

Botanical name-Family	Local name	Part used	Usage form	Administration mode	Disease	Reference
Achillea millefolium L. Asteraceae	Chau, Pehlkach, Rainthal, Pahel-ghass	Aerial parts, leaves, root, whole plant, raw	Paste, powder	Oral	Urinary disorders, abdominal worms, snakebite	Jamwal & Kant 2008, Dar *et al.* 2018, Khan & Kumar 2012, Dutta *et al.* 2021a, Ahmad *et al.* 2017
Achyranthes aspera L. Amaranthaceae	Puthkanda	Whole plant	Paste	Oral	Swellings	Jamwal & Kant 2008
Aconitum heterophyllum Wall. ex Royle Ranunculaceae	Patris, Pivak, Mori	Tuber	Powder, Paste	Oral, Topical	Gaseous bloat, dysentery, cough, snakebite	Bhardwaj *et al.* 2013, Khateeb *et al.* 2015, Khan & Kumar 2012, Dutta et al. 2021a
Aconitum laeve Royle Ranunculaceae	Muneri	Tuber	Aqueous extract	Oral	Stomach ailment, worms in the liver, weakness after diarrhea, delivery	Khuroo *et al.* 2007
Acorus calamus L. Acoraceae	Naglash, bachh, baryaan, Bach, Pyozkartal,	Whole plant, rhizome	Powder, paste, raw, mixture	Oral, Topical	Diarrhea, dyspepsia, anthelminthic infestation, internal parasites, wounds, snakebite, allergy, stomach pain	Khateeb *et al.* 2015, Mahumad & Shah 2009, Sharma & Manhas 2015, Sharma *et al.* 2012, Khan & Kumar 2012, Khan & Paul 2017, Dutta *et al.* 2021
Actaea spicata L. Ranunculaceae	Banparthi, Larddi	Fruit, Root,	Powder, paste	Oral	Paralysis, worms in the stomach, asthma	Bhardwaj *et al.* 2013, Khuroo *et al.* 2007
Aegle marmelos (L.) Corrêa Rutaceae	Bill	Fruit	Raw	Oral	Pneumonia, galactagogue	Sharma & Manhas 2015, Sharma *et al.* 2012
Aesculus indica (Wall. ex Cambess.) Hook. Sapindaceae	Han doun, Goon, Guen, Bankhori	Seed, Leaves	Powder, raw, soft balls	Oral	Colic, indigestion, helminthic infestation, stomachache & indigestion, cold, loose motion, pneumonia, chest disease	Khateeb *et al.* 2015, Sharma & Manhas 2015, Sharma *et al.* 2012, Sharma & Singh 1989, Bhardwaj *et al.* 2013, Rashid *et al.* 2007, Manzoor & Ali 2017
Ajuga parviflora Benth. Lamiaceae	Jan-i-adam, Ratibooty	Leaves, Aerial part	Aqueous extract, Paste	Oral, Topical	Weaknesses, indigestion, fever, sores, wounds, swelling	Bhardwaj *et al.* 2013, Khuroo *et al.* 2007
Albizia lebbeck (L.) Benth. Fabaceae	Sareen	Seed		Oral, Topical	Conjunctivitis	Sharma & Manhas 2015, Sharma *et al.*, 2012.
Alisma plantago-aquatica L. Alismataceae		Stem	Paste	Oral	Intermittent fever	Mahumad & Shah 2009

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Allium × proliferum (Moench) Schrad. ex Willd. Amaryllidaceae	Praan	Bulb	Soft balls	Oral	Frothy bloat, cold	Bhardwaj *et al.* 2013
Allium atropurpureum Waldst. & Kit. Amaryllidaceae	Wan- pran	Bulb	Paste	Oral	Anorexia	Rashid *et al.* 2007
Allium cepa L. Amaryllidaceae	Ganda, Gundh, Pyaaz, Gande	Bulb	Paste, Raw, Soft balls	Oral, Topical	Swellings, cold, anorexia, stimulate the estrus cycle, frothy bloat, stomach disorder, fever, skin infections, snakebite, stimulate the estrus cycle	Jamwal & Kant 2008, Bhardwaj *et al.* 2013, Ahmad *et al.* 2017, Sharma *et al.* 2012, Sofi *et al.* 2019, Mir 2014, Khuroo *et al.* 2007, Khan & Kumar 2012
Allium sativum L. Amaryllidaceae	Thoom, Lehsn, Rhoon	Bulb, Leaves	Raw, Paste, Powder	Oral	Aphrodisiac, diarrhea, abscess, stimulate the estrus cycle, abdominal worms, fever, cough, snakebite, pyrexia	Jamwal & Kant 2008, Khateeb *et al.* 2015, Rashid *et al.* 2007, Ahmad *et al.* 2017, Sofi *et al.* 2019, Khan & Kumar 2012, Dutta et al. 2021a.
Allium victorialis L. *Amaryllidaceae*	Van ganda	Whole plant	Raw	Oral	Cold, cough	Dar *et al.* 2018
Alnus nitida (Spach) Endl. Betulaceae	Sarol, Saroli	Leaves	Paste	Topical	Foot & Mouth Disease (FMD)	Ahmad *et al.* 2017, Khuroo *et al.* 2007.
Aloe vera (L.) Burm. f. Asphodelaceae	Kuargandal	Leaves, whole plant	Raw	Oral	Stomachache, indigestion	Sharma *et al.* 2012
Amaranthus caudatus L. Amaranthaceae	Seol, Ganhar, Leesa	Seed, Whole plant	Raw, powder	Oral	Weight gain, galactagogue, cold	Ahmad *et al.* 2017, Mir 2014, Rashid *et al.* 2007.
Amaranthus viridis L. Amaranthaceae	Cheri, Ghnar	Whole plant, seed	Paste, powder	Oral	Weakness, dizziness	Ahmad *et al.* 2017, Rashid *et al.* 2007
Angelica glauca Edgew. Apiaceae	Chora, Choor, Chouria, faka Gasse	Rhizome	Paste, powder, solution,	Oral, Topical	Cold, diarrhea, alopecia, tympany, bloat, cough, flatulence, acidity, abdominal colic, FMD, galactagogue	Bhardwaj *et al.* 2013, *Sofi et al.* 2019, Khateeb *et al.* 2015, Dar *et al.* 2018, Khan & Paul 2017, Khuroo et al., 2007
Aquilegia vulgaris L. *Ranunculaceae*	Dadue jaid	Whole plant	Juice	Oral	Weakness, galactagogue	Mir 2014
Aralia cachemirica Decne. Araliaceae	Chuhur	Root	Raw	Oral	Galactagogue	Dar *et al.* 2018.
Arisaema flavum (Forssk.) Schott Araceae	Hathbis, Sap ni mak	Seed, tuber	Mixture, Paste, Powder	Oral	Galactagogue, snakebite	Manzoor & Ali 2017, Khan & Kumar 2012
Arisaema jacquemontii Blume Araceae	Sap ni mak	Tuber, Fruit,	Paste, Powder, Raw	Oral, Topical	Pyrexia, snakebite	Khan & Kumar 2012, Khan & Paul 2017, Dutta *et al.* 2021a.

Arisaema propinquum Schott Araceae	Sarfamakai, Surumgundo, Sap ni mak, Sarf makyoth	Tuber, fruit	Paste	Oral, Topical	Intestinal infection, sexual stimulant, snakebite, allergy	Dar *et al.* 2018, Shah *et al.* 2015, Khan & Kumar 2012, Khan & Paul 2017
Arnebia benthamii (Wall. ex G. Don) I.M. Johnst. Boraginaceae	Kazaban, Ratanjal	Root	Decoction, Paste	Oral, Topical	Urinary problems, abscess maturation	Sofi *et al.* 2019, Khateeb *et al.* 2015
Artemisia absinthium L. Asteraceae	Bhurzale, Tethwan	Aerial part, Whole Plant, Leaves	Raw, Soft balls, Juice	Oral	Appetizer, abdominal worms, anthelminthic, liver infection	Rashid *et al.* 2007, Ahmad e*t al.* 2017, Sofi *et al.* 2019, Mir 2014
Artemisia annua L. Asteraceae	Kandhe	Flower	Paste	Oral	Diarrhea	Khateeb *et al.* 2015
Artemisia nilagirica (C.B. Clarke) Pamp. Asteraceae	Shambar	Leaves	Raw, powder	Oral, Topical	Anthelminthic , removal of internal parasites, lice, external parasites	Sharma & Manhas 2015, Sharma *et al.* 2012
Artemisia scoparia Waldst. & Kit. Asteraceae	Tethwan	Aerial part	Paste	Oral	Anthelminthic	Dar *et al.* 2018
Arundo donax L. Poaceae		Leaves	Powder	Oral	Dyspepsia	Mahumad & Shah 2009
Asparagus adscendens Roxb. Asparagaceae	Sansporh	Tuber	Powder	Oral	Diarrhea, blood in excreta, foot & mouth disease (FMD), ephemeral fever	Sharma *et al.* 2012
Asparagus filicinus Buch.-Ham. ex D. Don Asparagaceae		Seed	Infusion	Oral	Easy delivery	Khuroo *et al.* 2007
Asparagus racemosus Willd. Asparagaceae	Shahquaqual	Tuber	Powder	Oral	Kidney & liver disorder	Rashid *et al.* 2007
Azadirachta indica A. Juss. Meliaceae	Nim	Leaves	Paste, decoction	Oral, Topical	Removal of internal parasites, external parasites, wounds, FMD, hemorrhagic septicemia	Sharma & Manhas 2015, Sharma *et al.* 2012
Bacopa monnieri (L.) Wettst. Plantaginaceae	Jal neem	Whole plant	Raw	Oral	Galactagogue	Mahumad & Shah 2009
Baliospermum solanifolium (Burm.) Suresh Euphorbiaceae	Daenten	Root	Juice	Oral	Constipation, laxative	Rashid *et al.* 2007, Sharma & Singh 1989
Bambusa bambos (L.) Voss Poaceae	Baans	Leaves, stem	Raw	Oral, Topical	Anthelminthic, retention of placenta, blisters	Sharma & Manhas 2015, Sharma *et al.* 2012

Barleria cristata L. Acanthaceae	Sap ni jari	Whole plant	Paste	Oral	Snakebite	Khan & Kumar 2012
Berberis lycium Royle Berberidaceae	Shanfole, simblu	Root, Leaves, stem	Decoction, juice, powder, paster	Oral, Topical	Jaundice, wound, maggots in wounds, fractures	Khateeb *et al.* 2015, Rashid *et al.* 2007, Dutta *et al.* 2021a
Bergenia ciliata (Haw.) Sternb Saxifragaceae	Zakhmihyat, Palpati, Sapdatry	Leaves, rhizome	Powder, paste. Raw, mixture, decoction	Oral, Topical	Diarrhea, weakness, galactagogue, foot & mouth disease (FMD), wound	Bhardwaj *et al.* 2013, Rashid *et al.* 2007, Sharma & Singh 1989, Dar *et al.* 2018, Khateeb *et al.* 2015
Bergenia pacumbis (Buch.-Ham. ex D. Don) C.Y. Wu & J.T. Pan Saxifragaceae	Pulfort	Rhizome	Powder	Oral	Diarrhea, weakness, galactagogue	Mir 2014
Bistorta amplexicaulis (D. Don) Greene Polygonaceae	Masloon, Ragadh mundh	Whole plant, rhizome	Raw, powder	Oral	Galactagogue, internal injury	Dutta *et al.* 2021a, Khateeb *et al.* 2015
Boerhavia diffusa L. Nyctaginaceae	Itt-sitt	Root, Leaves, whole plant	Powder, Decoction, raw, Soft balls	Oral	Black Quarter, weed intoxication, wound, poisoning	Rashid *et al.* 2007, Sharma & Manhas 2015, Sharma *et al.* 2012, Sharma & Singh 1989
Brassica juncea (L.) Czern. Brassicaceae	Sarsoon	Flower	Powder, oil	Oral	Constipation, indigestion, yoke gall	Khateeb *et al.* 2015.
Brassica rapa L. Brassicaceae	Sarson, Saryan, Tilgogul, khal	Seed, Leaves	Paste, Cakes, Oil, Raw, Residue	Oral, Topical	Skin infections, abdominal worms, anthelminthic, bone fracture, indigestion, vitality, vigor, galactagogue, foul smell in dung, retention of placenta	Ahmad *et al.* 2017, Sharma & Manhas 2015, Bhardwaj *et al.* 2013, Sofi *et al.* 2019, Mir 2014, Dutta *et al.* 2021a
Bupleurum falcatum L. Apiaceae	Peeley phul wali jari, nagdun	Whole plant	Paste	Oral	Snakebite	Khan & Kumar 2012
Calotropis procera (Aiton) W.T. Aiton Apocynaceae	Desi-ak, Nikka Ak, akk,	Leaves, root, flower, stem	Raw, Powder, Paste, Raw, Mixture,	Oral, Topical	Anorexia, muscle pain, pyrexia, pneumonia, tail gangrene, hemorrhagic septicemia (HS)	Jamwal & Kant 2008, Rashid *et al.* 2007, Sharma *et al.* 2012, Dutta *et al.* 2021a, Sharma & Singh 1989
Camellia sinensis (L.) Kuntze Theaceae	Chaa	Leaves	Decoction	Oral	Indigestion	Khateeb *et al.* 2015.
Cannabis sativa L. Cannabaceae	Bhang, Charusi kul, Pangg	Leaves	Paste, Powder, Raw	Oral, Topical	Anorexia, lice & ticks, estrous problem, body pain, anthelminthic	Jamwal & Kant 2008, Ahmad *et al.* 2017, Sofi *et al.* 2019, Dutta *et al.* 2021a
Capsicum annuum L. Solanaceae	March, Mirch, Marchagun	Fruit	Raw, Paste, Powder, Soft balls	Oral, Topical	Helminthic infestation, dog bite, cough, anthelminthic, pneumonia, pyrexia	Sharma & Manhas 2015, Sharma *et al.* 2012, Sofi *et al.* 2019, Khan & Paul 2017, Dutta *et al.* 2021a

Carissa spinarum L. Apocynaceae	Garna	Leaves, Aerial part	Raw	Oral	Galactagogue	Sharma *et al.* 2012
Cassia fistula L. Fabaceae	Karangal	Leaves, fruit	Raw, Juice	Oral, Topical	Constipation, indigestion, conjunctivitis,	Sharma & Manhas 2015, Sharma *et al.* 2012
Causonis trifolia (L.) Mabb. & J. Wen Vitaceae	Gidardar	Roots	Raw	Oral	Bone dislocation	Sharma *et al.* 2012
Cedrus deodara (Roxb. ex D. Don) G. Don Pinaceae	Devdoor, Kelam, Deodar,	Stem, Oil, Resin,	Oil, paste	Oral, Topical	Alopecia, vomiting, pleuritis, lice & ticks, mange, foot & mouth disease (FMD), broken horn, Insect repellent	Bhardwaj *et al.* 2013, Khateeb *et al.* 2015, Ahmad *et al.* 2017, Sharma & Manhas 2015, Sharma *et al.* 2012, Sofi *et al.* 2019
Centella asiatica (L.) Urb. Apiaceae	Brahmi	Whole plant	Raw	Oral	General weakness, galactagogue	Sharma *et al.* 2012
Ceratophyllum demersum L. Ceratophyllaceae		Leaves	Powder	Oral	Diarrhea	Mahumad & Shah 2009
Chenopodium album L. Amaranthaceae	Wanpalak, Bathua	Leaves, whole plant	Paste, paste, raw	Oral, Topical	Wound, intestinal problems	Ahmad *et al.* 2017, Sofi *et al.* 2019
Cicer arietinum L. - Fabaceae	Channa	Seed	Raw	Oral	Galactagogue, weakness	Sharma *et al.* 2012.
Cirsium arvense (L.) Scop. Asteraceae	Babool	Seed, Root	Raw, Powder	Oral	Pneumonia, appetizer, food poisoning, blood in stool & urine	Sharma & Manhas 2015, Sharma *et al.* 2012.
Cissampelos pareira L. Menispermaceae		Leaves	Paste	Oral	Digestive disorders	Jamwal & Kant 2008
Citrus medica L. Rutaceae	Gargal	Fruit	Pickle, raw	Oral	Weed intoxication, bloat, poisoning	Sharma & Manhas 2015, Sharma *et al.* 2012
Clematis grata Wall. Ranunculaceae	Beladi	Leaves	Juice	Topical	Wounds	Dutta *et al.* 2021a
Codonopsis rotundifolia Benth. Campanulaceae	Tunda-jaide	Whole plant	Juice	Oral	Weakness, asthma	Mir 2014
Colocasia esculenta (L.) Schott Araceae	Arvi	Leaves	Raw	Oral	Anestrous	Mahumad & Shah 2009
Convolvulus arvensis L. Convolvulaceae		Whole plant	Paste	Oral	Constipation, galactagogue	Ahmad *et al.* 2017
Crocus sativus L. Iridaceae	Zaffaran safran	Flower	Mixture	Oral	Fever	Rashid *et al.* 2007

Curcuma longa L. Zingiberaceae	Basaar, haldi, Ladder gunder	Rhizome	Solution, Powder, paste	Oral, Topical	Internal injury, wound, blood in excreta, fever, FMD, fracture, broken horn, joint problem.	Khateeb *et al.* 2015, Ahmad *et al.* 2017, Sharma & Manhas 2015, Sharma *et al.* 2012, Sofi *et al.* 2019
Cuscuta europaea L. Convolvulaceae	Kukili Pot	Stem	Powder	Topical	External parasites	Dar *et al.* 2018
Cuscuta reflexa Roxb. Convolvulaceae	Kukili pot, Gili Pot	Stem	Powder	Topical	Astringent	Dar *et al.* 2018
Cynodon dactylon (L.) Pers. Poaceae	Droub, Khabbal	Root, Whole plant	Raw, paste	Oral, Topical	Oliguria, wounds	Khateeb *et al.* 2015, Dutta *et al.* 2021a
Datura stramonium L. - Solanaceae	Datura	Seed	Smoke, raw, powder	Oral, Topical	Diarrhea, leeches, cold, urinary infection	Sofi *et al.* 2019, Bhardwaj *et al.* 2013, Mir 2014
Delphinium denudatum Wall. ex Hook. f. & Thomson Ranunculaceae	Nirbassi, Sap ni jari	Tuber	Paste, powder	Oral, Topical	Snake bite, wound, cancer	Sharma & Manhas 2015, Sharma *et al.* 2012, Khan & Kumar 2012
Delphinium roylei Munz - Ranunculaceae	Moori	Tuber, Whole plant	Raw, powder	Oral	Liver infection	Rashid *et al.* 2007, Ahmad *et al.* 2017, Sharma & Singh 1989
Dioscorea bulbifera L. - Dioscoreaceae	Chachla g&a, Kala ganda, Kithi ganda	Tuber	Raw	Oral	Snakebite	Khan & Kumar 2012
Diplocyclos palmatus (L.) C. Jeffrey Cucurbitaceae		Fruit	Raw	Oral	Snakebite	Jamwal & Kant 2008
Dipsacus inermis Wall. Caprifoliaceae	Wopal Hakh	Leaves	Decoction	Oral	Galactagogue, health after delivery, galactagogue	Bhardwaj *et al.* 2013, Mir 2014
Dodonaea viscosa Jacq. Sapindaceae	Saentha	Leaves	Aqueous extract	Oral	Intestinal worms	Rashid *et al.* 2007, Sharma & Singh 1989
Dolomiaea costus (Falc.) Kasana & A.K.Pandey Asteraceae	Kouth	Root	Soft balls	Oral	Cold	Bhardwaj *et al.* 2013
Dysphania ambrosioides (L.) Mosyakin & Clemants Amaranthaceae	Jungli Bathua	Leaves	Paste	Oral	Intestinal worms	Mahumad & Shah 2009
Eclipta prostrata (L.) L. Asteraceae	Kesar Raja	Leaf, stem	Paste, Juice	Topical, Oral	Insect bite, cuts, foot & mouth disease, dysentery	Mahumad & Shah 2009
Elwendia persica (Boiss.) Pimenov & Kljuykov Apiaceae	Jangli zeera	Seed	Raw	Oral	Appetizer	Sofi *et al.* 2019

Equisetum diffusum D. Don Equisetaceae	Ram pori	Whole plant	Decoction	Oral	Urolithiasis	Khateeb *et al.* 2015
Erigeron canadensis L. - Asteraceae	Shallut	Aerial part	Soft balls	Oral	Indigestion, dysentery	Bhardwaj *et al.* 2013, Mir 2014
Eruca vesicaria (L.) Cav. Brassicaceae	Tara–mira	Seed	Raw	Topical	Mange, galactagogue, weakness	Sharma & Manhas 2015, Sharma *et al.* 2012
Euphorbia hirta L. Euphorbiaceae		Whole plant	Juice	Oral	Hemorrhagic enteritis	Jamwal & Kant 2008
Euphorbia royleana Boiss. Euphorbiaceae		Latex	Latex	Topical	Fracture	Jamwal & Kant 2008
Euphorbia wallichii Hook. f. Euphorbiaceae	Gur tsochal	Latex	Raw	Topical	Fingal infection, foot & mouth disease (FMD)	Dar *et al.* 2018
Fagopyrum esculentum Moenc Polygonaceae	Chok drou	Leaves	Raw	Oral	Liver problem	Khateeb *et al.* 2015
Ferula narthex Boiss. Apiaceae	Hing	Root		Oral	Indigestion	Sharma & Manhas 2015
Ficus auriculata Lour. Moraceae	Thubar	Fruit, Leaves	Raw	Oral	Galactagogue	Rashid *et al.* 2007
Ficus benghalensis L. Moraceae		Leaves	Paste	Topical	Fracture	Jamwal & Kant 2008
Ficus carica L. Moraceae	Tarkkani kembri	Leaves	Raw	Oral	Easy delivery	Dutta *et al.* 2021a
Ficus hispida L. f. Moraceae	Lana	Fruit	Raw	Oral, Topical	Galactagogue	Sharma *et al.* 2012.
Ficus palmata Forssk. - Moraceae	Kamari	Stem bark	B&age	Topical	Wounds	Rashid *et al.* 2007.
Ficus religiosa L. Moraceae	Barh, Peepal	Leaves	Raw, decoction	Oral, Topical	Mange, galactagogue, hair fall	Sharma & Manhas 2015, Sharma *et al.* 2012
Foeniculum vulgare Mill. Apiaceae	Saunf, Badiyan kul	Aerial part, Fruit	Decoction, raw	Oral	Indigestion, appetizer, diarrhea	Ahmad *et al.* 2017, Sharma *et al.* 2012, Sofi *et al.* 2019
Fragaria nubicola (Lindl. ex Hook. f.) Lacaita Rosaceae	Yangraich	Whole plant, root	Decoction	Oral	Cough, cold, flatulence	Dar *et al.* 2018
Fumaria indica (Hausskn.) Pugsley Papaveraceae	Shahtar	Whole plant	Decoction	Oral	Liver tonic, anthelminthic	Sofi *et al.* 2019
Fumaria parviflora Lam. Papaveraceae	Chauriata	Whole plant	Raw	Oral	Vomiting, pneumonia, jaundice	Khateeb *et al.* 2015

Galium aparine L. Rubiaceae	Zoa Ghasa, Khurti	Whole plant	Poultice	Topical	Wound	Bhardwaj *et al.* 2013
Gentiana kurroo Royle Gentianaceae	Butein	Whole plant	Raw	Oral	Jaundice	Khateeb *et al.* 2015
Gentiana phyllocalyx C.B. Clarke Gentianaceae	Phangre	Whole part	Raw	Oral	Loose motion	Rashid *et al.* 2007, Sharma & Singh 1989
Geranium wallichianum D. Don ex Sweet Geraniaceae	Ratanjog, Kaw Gasse, Rattanjot	Root, Whole plant, rhizome	Paste, Soft balls, Fresh root, Pudding	Oral, Topical	Weakness, galactagogue, dislocated joints, inflammation of hooves, warts & abscission, wounds, Pyrexia, galactagogue	Bhardwaj *et al.* 2013, Dar *et al.* 2018, Khuroo *et al.* 2007, Dutta *et al.* 2021a
Girardinia diversifolia (Link) Friis Urticaceae	Sadhar, Kayari, Badde-sadhar	Root, Leaves	Soft balls, Powder, Paste	Oral, Topical	Red water diseases, retention of placenta, wounds	Rashid *et al.* 2007, Dutta *et al.* 2021a, Sharma & Singh 1989
Gloriosa superba L. Colchicaceae	Sap ki jari	Tuber	Paste	Oral	Snakebite	Khan & Kumar 2012
Glycine max (L.) Merr. Fabaceae	Gabbe Muth	Seed	Powder	Oral	Lactation	Khuroo *et al.* 2007
Gossypium hirsutum L. Malvaceae	Kapah, Kapas	Seed	Raw	Oral	Diarrhea, blood in excreta, galactagogue, general weakness	Sharma & Manhas 2015, Sharma *et al.* 2012
Grewia optiva J.R. Drumm. ex Burret Malvaceae	Damman, Thaman	Leaves	Raw	Oral	Internal parasites, Induce puberty, retention of placenta	Sharma *et al.* 2012, Manzoor & Ali 2017, Dutta *et al.* 2021a
Hedera nepalensis K. Koch Araliaceae	Batulo	Fruit	Powder	Topical	Removal of leech from nostril, nose bleeding	Shah *et al.* 2015
Helianthus annuus L. Asteraceae	Gul-e-aftab	Fruit	Raw	Oral	Tonic	Mir 2014.
Hordeum vulgare L. Poaceae	Jau	Grains	Raw, Powder	Oral	General weakness, Galactagogue, blood in excreta, FMD	Sharma *et al.* 2012
Hyoscyamus niger L. - Solanaceae	Bazar bhang	Leaves	Decoction	Oral	Toxicity	Rashid *et al.* 2007
Inula royleana DC. Asteraceae	Gugi Phool	Flower	Decoction	Topical	Throat sores, wounds, inflammation on the hooves	Khuroo *et al.* 2007
Iris kashmiriana Baker Iridaceae	Mazarmund	Rhizome, Leaves	Soft balls, Raw	Oral	Weakness, liver disorders	Bhardwaj *et al.* 2013, Rashid *et al.* 2007
Isodon rugosus (Wall. ex Benth.) Cod Lamiaceae	Sloi	Leaves	Raw	Oral	Throat infections	Khuroo *et al.* 2007
Juglans regia L. Juglandaceae	Duon, Dunkul	Seed	Cakes, paste, oil	Oral, Topical	Galactagogue, FMD	Bhardwaj *et al.* 2013, Sofi *et al.* 2019, Mir 2014

Jurinea heteromalla (D. Don) N.Garcia, Herrando & Susanna Asteraceae	Banjeeri	Seed	Raw	Oral	Pneumonia, general weakness	Sharma *et al.* 2012
Justicia adhatoda L. Acanthaceae	Vasak	Root	Decoction	Oral	Constipation	Sharma *et al.* 2012
Koenigia alpina (All.) T.M. Schust. & Reveal Polygonaceae	Tsokemuth	Leaves	Paste	Oral	Indigestion	Dar *et al.* 2018
Lagenaria siceraria (Molina) Standl. - Cucurbitaceae	Kashir Aull	Fruit	Paste	Topical	Yoke gall	Bhardwaj *et al.* 2013
Linum usitatissimum L. Linaceae	Alish	Whole plant	Cakes	Oral	Galactagogue	Bhardwaj *et al.* 2013
Litsea ligustrina (Nees) Fern.-Vill. Lauraceae	Rehen	Stem bark, Root	Raw, powder	Oral, Topical	Dislocated joints	Rashid *et al.* 2007, Sharma & Singh 1989
Lysimachia arvensis (L.) U. Manns & Anderb Primulaceae	Chari saben	Leaves	Decoction	Topical	Leeches in nostrils	Mahumad & Shah 2009
Mallotus philippensis (Lam.) Müll.Arg. Euphorbiaceae	Kamila	Fruit	Powder, paste	Oral	Abdominal worms, anthelminthic, internal parasites	Ahmad *et al.* 2017, Sharma & Manhas 2015, Sharma *et al.* 2012
Malva neglecta Wallr. Malvaceae	Sochal	Leaves, aerial part, whole plant	Soft balls, raw, paste	Oral	Constipation, retention of placenta, general tonic, galactagogue, weakness, fever, indigestion, diarrhea	Bhardwaj *et al.* 2013, Dar *et al.* 2018, Rashid *et al.* 2007, Ahmad *et al.* 2017, Sofi *et al.* 2019, Mir 2014
Malva sylvestris L. Malvaceae	Sai Sonchal, Gurisochal, Sotzhal	Whole plant, leaves, flower	Raw, paste, decoction	Oral	Galactagogue, respiratory disorders	Rashid *et al.* 2007, Mir 2014, Khuroo *et al.* 2007
Mangifera indica L. Anacardiaceae	Amb	Fruit, Leaves, stem	Decoction	Oral	Indigestion, weed intoxication	Sharma & Manhas 2015, Sharma *et al.* 2012
Marrubium vulgare L. Lamiaceae	Troper	Whole plant	Paste	Oral	Dysentery	Bhardwaj *et al.* 2013
Melia azedarach L. Meliaceae	Darenk	Leaves	Raw, Powder, solution	Oral, Topical	Swellings, fracture, FMD	Jamwal & Kant 2008, Ahmad *et al.* 2017, Sharma *et al.* 2012
Mentha arvensis L. Lamiaceae	Pudina	Leaves	Raw	Oral	Appetizer, bloating	Sharma *et al.* 2012
Mentha longifolia (L.) L. Lamiaceae	Jungli Pudna, Pootna, Futina	Whole plant, Leaves	Paste, Decoction, Raw, Soft balls	Oral	Dysentery, pyrexia, abdominal worms, anthelminthic	Mahumad & Shah 2009, Dutta *et al.* 2021a, Ahmad *et al.* 2017, Sofi *et al.* 2019

Morus alba L. Moraceae	Tul	Leaves	Raw	Oral	Fodder	Mir 2014
Morus nigra L. Moraceae	Tulkul	Leaves	Paste	Topical	Wound healing	Sofi *et al.* 2019
Musa × paradisiaca L. Musaceae	Kela	Pulp, Leaves, fruit, rhizome, Stem	Raw	Oral	FMD, weed intoxication, galactagogue, diarrhea, hematuria	Sharma & Manhas 2015, Sharma *et al.* 2012
Neopicrorhiza scrophulariiflora (Pennell) D.Y. Hong Plantaginaceae	Kour	Rhizome	Powder	Oral	Stomachache	Khateeb *et al.* 2015.
Nepeta cataria L. Lamiaceae	Brarigasse, Gondhsoi	Aerial part, leaves	Decoction	Oral	Dysentery, diarrhea	Dar *et al.* 2018, Rashid *et al.* 2007
Nepeta laevigata (D. Don) Hand.-Mazz. Lamiaceae	Longir	Flower	Decoction	Oral	Intestinal disorders, urine infection	Khuroo *et al.* 2007
Nicotiana plumbaginifolia Viv. Solanaceae	Desi Tambaku	Whole plant, leaves	Raw, powder	Oral, Topical	Bloat, external parasites, pyrexia	Sharma *et al.* 2012
Nicotiana tabacum L. Solanaceae	Tambaku	Leaves	Solution, infusion	Oral, Topical	Myiasis, wounds, external parasites	Rashid *et al.* 2007, Sharma *et al.* 2012
Nymphaea nouchali Burm. f Nymphaeaceae	Safed Kamal	Rhizome	Juice	Oral	Diarrhea	Mahumad & Shah 2009
Nymphoides peltata (S.G. Gmel.) Kuntze Menyanthaceae	Khuar	Whole plant	Mixture, raw	Oral	Galactagogue	Rashid *et al.* 2007, Mahumad & Shah 2009
Ocimum tenuiflorum L. Lamiaceae	Tulsi	Leaves	Decoction, raw	Oral, Topical	Bloat, redness in eye, conjunctivitis	Sharma *et al.* 2012, Sharma & Manhas 2015
Oreoseris gossypina (Royle) X.D. Xu & V.A. Funk Asteraceae	Puzale, Bhurzale	Root	Powder, paste	Oral, Topical	Tonsilitis, wound	Sharma & Singh 1989, Rashid *et al.* 2007
Oroxylum indicum (L.) Kurz Bignoniaceae	Tantara	Seed, Stem	Decoction, mixture, Raw	Oral	Constipation, snakebite	Sharma & Manhas 2015, Sharma e*t al.* 2012
Oryza sativa L. Poaceae	Daani, Chol, chawal	Seed	Raw, paste, solution, Aqueous extract, mixture	Oral, Topical	Retention of placenta, constipation, hematuria, mange, galactagogue,	Bhardwaj *et al.* 2013, Khateeb *et al.* 2015, Sharma & Manhas 2015, Sharma *et al.* 2012
Oxalis acetosella L. Oxalidaceae	Chukchani	Leaves	Paste	Oral	Stomach, chest disorders	Dar *et al.* 2018
Oxalis corniculata L -Oxalidaceae	Shoti-ami	Whole plant	Juice	Oral	Scabies, warts, skin disorders	Sharma & Singh 1989, Rashid *et al.* 2007

Persicaria acuminata (Kunth) M. Gómez Polygonaceae	Jal bahar	Leaves	Juice	Topical	Fly infected wounds	Mahumad & Shah 2009
Persicaria hydropiper (L.) Delarbre Polygonaceae	Jal mirchi	Leaves	Paste	Topical	Tongue infection	Mahumad & Shah 2009
Persicaria mitis (Schrank) Asseno -Polygonaceae	Laddar	Whole plant	Raw	Oral	Dysentery	Mahumad & Shah 2009
Phanera vahlii (Wight & Arn.) Benth. Fabaceae	Balungad	Aerial part, seeds, stem	Paste	Oral	Anthelminthic, internal parasites	Sharma & Manhas 2015, Sharma *et al.* 2012
Phlomoides superba (Royle ex Benth.) Kamelin & Makhm. Lamiaceae	Rhizome	Whole plant	Raw	Oral	Galactagogue	Ahmad *et al.* 2017
Phyla nodiflora (L.) Greene Verbenaceae	Jal pipli	Roots	Powder	Oral	Indigestion	Mahumad & Shah 2009
Phyllanthus emblica L. Phyllanthaceae	Amla	Fruit	Raw, Juice, Mixture, Paste	Oral	Indigestion, anthelminthic, weed toxication, FMD, blood in excreta, ephemeral fever, stomachache, external & internal parasites, diarrhea	Sharma & Manhas 2015, Sharma *et al.* 2012
Phytolacca acinosa Roxb. Phytolaccaceae	Asral, kafal	Whole plant, root	Solution, raw	Oral	Hematuria, inability to inseminate	Khateeb *et al.* 2015, Dutta *et al.* 2021a
Picrorhiza kurroa Royle ex Benth. Plantaginaceae	Koud, Kutki, Chobikhor	Rhizome	Soft balls, juice	Oral	Pneumonia, tapeworms, general debility	Bhardwaj *et al.* 2013, Rashid *et al.* 2007
Pinus roxburghii Sarg. Pinaceae	Chir, Kangul	Resin, stem	Resin, raw	Topical	External parasites, broken horn, wound	Sharma & Manhas 2015, Sharma *et al.* 2012, Khateeb *et al.* 2015
Pinus wallichiana A.B. Jacks. Pinaceae	Kayud	Leaves	Raw	Oral	Anthelminthic	Ahmad *et al.* 2017, Sofi *et al.* 2019
Piper nigrum L. Piperaceae	Kale march	Fruit, seed	Powder	Oral	Indigestion, liver problems, snakebite	Khateeb *et al.* 2015, Sharma & Manhas 2015
Plantago lanceolata L. Plantaginaceae	Kashur Gulla, Chamchipeti, Gull	Whole plant, aerial part	Juice, raw, paste	Oral, Topical	Yoke gall, galactagogue, general tonic, digestive disorders, skin rashes,	Bhardwaj *et al.* 2013, Mir 2014, Dar *et al.* 2018
Plantago major L. Plantaginaceae	Bud gull	Whole plant	Raw	Oral	Fodder	Mir 2014

Plumbago zeylanica L. Plumbaginaceae	Chtra	Root, leaves	Paste	Oral, Topical	Mange, appetizer	Sharma & Manhas 2015, Sharma *et al.* 2012
Podophyllum hexandrum Royle Berberidaceae	Bankhakri wanwangun	Fruit, rhizome	Powder, paste	Topical	Eye wound, snakebite	Dar *et al.* 2018, Khan & Kumar 2012
Polygonatum oppositifolium (Wall.) Royle Asparagaceae	Doodedaani	Root	Powder	Oral	Post-partum infection, excessive bleeding	Dar *et al.* 2018
Polygonatum verticillatum (L.) All. Asparagaceae	Doodedaani, Tsok ladar, Marchwangan, Pipla	Aerial part, leaves	Raw, paste, powder	Oral, Topical	galactagogue, dysentery, tongue infection	Dar *et al.* 2018, Rashid *et al.* 2007, Sharma & Singh 1989, Rashid *et al.* 2007
Polygonum plebeium R. Br. Polygonaceae	Rani phal	Whole plant	Raw	Oral	Galactagogue	Mahumad & Shah 2009.
Pontederia crassipes Mart. Pontederiaceae		Leaves, Flower	Powder, Raw	Topical, Oral	Skin fissures, cracks, galactagogue	Mahumad & Shah 2009
Populus nigra L. Salicaceae	Phras	Stem bark, leaves, seed	Decoction, soft balls, raw	Oral, Topical	Anthelminthic, cuts & wounds	Ahmad *et al.* 2017, Sofi *et al.* 2019, Rashid *et al.* 2007
Primula denticulata Sm. Primulaceae	Landanposh, Lattar-phul	Whole plant, Flower	Paste	Oral	Snakebite	Khan & Kumar 2012, Dutta *et al.* 2021a
Primula macrophylla D. Don Primulaceae	Ladanposh	Whole plant	Powder	Oral	Snakebite	Khan & Kumar 2012
Prinsepia utilis Royle Rosaceae	Zintola	Aerial part, stem	Powder, Paste	Oral, Topical	Digestive disorders, stomatitis, cough	Jamwal & Kant 2008, Khateeb *et al.* 2015
Prunella vulgaris L. Lamiaceae	Kulwauth	Whole plant, aerial part	Decoction	Oral	Fever, cold, indigestion, stomach, liver disorders	Sofi *et al.* 2019, Dar *et al.* 2018
Prunus armeniaca L. Rosaceae	Haari/ Charota, cheir	Fruits, Seeds	Powder, paste	Oral	Anthelminthic	Dutta *et al.* 2021a, Sofi *et al.* 2019
Prunus persica (L.) Batsch Rosaceae	Chenun, Aaru, Chenen kul	Leaves	Poultice, juice	Topical	Wound, external parasites, FMD	Bhardwaj *et al.* 2013, Sharma *et al.* 2012, Sofi *et al.* 2019
Psidium guajava L. Myrtaceae	Amrood	Leaves	Paste	Oral	Ephemeral fever	Sharma *et al.* 2012
Pueraria tuberosa (Willd.) DC. Fabaceae	Salod, Bidh	Leaves, branches, tuber	Raw, powder	Oral	Health, sexual stimulant	Sharma *et al.* 2012, Shah *et al.* 2015

Punica granatum L. Lythraceae	Nardana, Anardana, Anar, Darunni	Fruit, seed	Powder, paste, solution, raw	Oral	Dysentery, hemorrhagic enteritis, urinary problem, liver problem, prolapse	Rashid *et al.* 2007, Jamwal & Kant 2008, Khateeb *et al.* 2015, Sharma *et al.* 2012, Dutta *et al.* 2021a
Pyrus pashia Buch.-Ham. ex D. Don Rosaceae	Kanth	Fruit	Juice	Topical	Eye diseases, conjunctivitis	Jamwal & Kant 2008, Sharma & Manhas 2015, Sharma *et al.* 2012
Quercus oblongata D. Don Fagaceae	Ree	Stem Bark	Decoction	Oral	Internal injury	Shah *et al.* 2015
Quercus rotundifolia Lam. Fagaceae	Chor	Stem	Smoke	Topical	Galactagogue	Sofi *et al.* 2019
Quercus semecarpifolia Sm. Fagaceae	Kharsu	Leaves	Raw	Oral	Bloating	Shah *et al.* 2015
Ranunculus bulbosus L. Ranunculaceae	Maleen, Kh& barian	Bulb	Raw, Powder, Paste	Oral	Pneumonia, anthelminthic, weakness	Dutta *et al.* 2021a, Shah *et al.* 2015
Ranunculus hirtellus Royle Ranunculaceae	Mangol	Aerial part	Raw	Oral	Refrigerant, effects of heat	Sharma & Singh 1989, Rashid *et al.* 2007
Ranunculus muricatus L. Ranunculaceae	Kakodel	Aerial part	Decoction	Oral	Fever, nausea	Khuroo *et al.* 2007
Ranunculus trichophyllus Chaix Ranunculaceae		Leaf	Juice	Topical	Inflammation	Mahumad & Shah 2009
Rheum australe D. Don Polygonaceae	Pamb-e-chari	Rhizome	Paste	Topical	Fracture	Shah *et al.* 2015
Rheum webbianum Royle Polygonaceae	Panbchalan	Rhizome	Powder, paste, Decoction	Oral, Topical	Anemia, wound, internal injury, scabies, mumps	Khateeb *et al.* 2015, Dar *et al.* 2018
Rhodiola rosea L. Crassulaceae	Hasbi jund	Stem	Powder	Topical	Wound	Khuroo *et al.* 2007
Rosa indica L. Rosaceae	Gulab	Flower	Raw	Oral	Constipation, cold	Sharma *et al.* 2012, Mir 2014
Rumex acetosa L. Polygonaceae	Hulla, Abjie, Holla	Root	Powder, Soft balls	Oral	Loose motions, cough, cold, Bloat, sprain	Rashid *et al.* 2007, Mir 2014, Sharma & Singh 1989
Rumex dentatus L Polygonaceae	Obej, Hulla	Root	Soft balls, Powder	Oral	Cough, gaseous bloat, sprains, Diarrhea	Bhardwaj *et al.* 2013, Mahumad & Shah 2009
Rumex nepalensis Spreng. Polygonaceae	Hubul, Abij, Hula, halfali	Leaf, root	Solution, Powder, Soft balls, Juice	Oral, Topical	Tympany, bloat, fever, juvenile infections, antiseptic, liver disorders, general weakness, cough	Khateeb *et al.* 2015, Khuroo *et al.* 2007, Dar e*t al.* 2018, Dutta *et al.* 2021a

Rumex patientia L. Polygonaceae	Jungli abij	Root	Powder	Oral	Liver-fluke, digestive disorders	Khuroo *et al.* 2007
Rumex patientia L. Polygonaceae	Obuj, Abul	Roots	Powder, Paste	Oral	Indigestion, liver fluke disease, Liver disorder, digestion problems	Ahmad *et al.* 2017, Sofi *et al.* 2019
Saccharum officinarum L. Poaceae	Ganna	Stem, leaves	Juice, raw	Oral	Diarrhea, helminthic infections, constipation	Sharma & Manhas 2015, Sharma *et al.* 2012
Sagittaria sagittifolia L. Alismataceae		Leaves	Juice	Oral	Skin diseases	Mahumad & Shah 2009
Salix alba L. *Salicaceae*	Vir, vid	Stem bark, Leaves	Decoction, raw, soft balls	Oral	Anthelminthic	Ahmad *et al.* 2017, Sofi *et al.* 2019
Sambucus wightiana Wall. ex Wight & Arn. Viburnaceae	Ghoola	Root	Juice	Topical	Foot & mouth disease (FMD)	Bhardwaj *et al.* 2013
Sapindus mukorossi Gaertn. Sapindaceae	Reetha	Fruit	Paste	Topical	External parasites, Leech removal	Sharma & Manhas 2015, Sharma *et al.* 2012
Sauromatum venosum (Dry&. ex Aiton) Kunth Araceae	Surganda	Fruits	Raw	Oral	FMD	Khan & Paul 2017
Saussurea simpsoniana (Fielding & Gardner) Lipsch. Asteraceae	Joge padshah	Leaves, Stem	Paste	Topical	Wounds	Ahmad *et al.* 2017
Senna occidentalis (L.) Link Fabaceae	Haedma	Leaves	Paste, decoction	Topical	Fracture, indigestion	Jamwal & Kant 2008, Sharma *et al.* 2012
Sesamum indicum L -Pedaliaceae		Leaves	Juice	Oral	Retention of placenta	Jamwal & Kant 2008
Silene vulgaris (Moench) Garcke Caryophyllaceae	Takla	Rhizome	Powder	Oral	Galactagogue	Khuroo *et al.* 2007
Sisymbrium irio L.- Brassicaceae	Cheri Laschij	Seed	Soft balls	Oral	Cough, cold	Bhardwaj *et al.* 2013, Mir 2014
Skimmia anquetilia Tayl. & Airy Shaw Rutaceae	Naera, Wangontar, Ganpatre, Patla	Leaves	Powder, Paste, Decoction	Oral	Indigestion, digestive & liver disorders, cough, cold, fever, Lung disease	Bhardwaj *et al.* 2013, Dar e*t al.* 2018, Khan & Paul 2017
Skimmia laureola (DC.) Decne. Rutaceae	Shungun, Nera, patla	Leaves, Root	Raw, Boiled leaves, Powder, Paste	Oral, Topical	Anemia, pyrexia, cold, fractures	Khateeb *et al.* 2015, Dutta *et al.* 2021a
Solanum lycopersicum L. Solanaceae	Tamatar, Rutwagun	Pulp, Fruit	Juice, raw	Oral	Tympany, bloating, intestinal problems	Khateeb *et al.* 2015, Sofi *et al.* 2019

Solanum melongena L. Solanaceae	Wangun	Root, Fruit	Raw	Oral	Anorexia	Rashid *et al.* 2007
Solanum nigrum L -Solanaceae	Kachmach	Whole plant	Paste	Oral	Digestive disorders, liver disorders	Jamwal & Kant 2008, Rashid *et al.* 2007
Sonchus arvensis L. Asteraceae	Dudh Kandij, Dudij	Whole plant	Raw	Oral	Galactagogue	Bhardwaj *et al.* 2013, Mir 2014
Sorghum halepense (L.) Pers Poaceae	Zahar ghass, Drahma, Baru	Rhizomes	Paste, powder	Oral, Topical	Mastitis, snakebite	Ahmad *et al.* 2017, Khan & Kumar 2012
Sunhangia elegans (DC.) H. Ohashi & K. Ohashi Fabaceae	Mothanag	Root	Raw	Oral	Appetizer	Rashid *et al.* 2007
Swertia petiolata D. Don Gentianaceae	Sarad Jaddi	Leaves	Paste	Topical	Wound	Khuroo *et al.* 2007
Tamarindus indica L. Fabaceae	Imli	Fruit	Raw, juice	Oral	Weed intoxication, snakebite, FMD	Sharma & Manhas 2015, Sharma *et al.* 2012
Taraxacum sect. Taraxacum F.H. Wigg. Asteraceae	Hannd, Madan hand	Leaves, Whole plant, Aerial part	Raw, Aqueous extract,	Oral	Galactagogue, colic, sprains, general weakness, liver problems, galactagogue, health	Jamwal & Kant 2008, Khateeb *et al.* 2015, Ahmad *et al.* 2017, Khuroo *et al.* 2007, Sofi *et al.* 2019, Mir 2014
Terminalia bellirica (Gaertn.) Roxb. Combretaceae	Badein, Bahera	Fruit	Powder	Oral	Indigestion	Sharma *et al.* 2012, Sharma & Manhas 2015
Terminalia chebula Retz. Combretaceae	Harad	Fruit	Powder	Oral	Indigestion	Sharma & Manhas 2015, Sharma *et al.* 2012
Thymus linearis Benth Lamiaceae	Jangli Javind, Chickni, Chicken, chikney	Aerial part, Whole plant	Decoction, raw, paste	Oral	Cough, cold, fever, snakebite, lung disease	Bhardwaj *et al.* 2013, Mir 2014, Khan & Kumar 2012, Khan & Paul 2017
Thymus serpyllum L. Lamiaceae	Jawand, Javend marchery, Ban-javend, Marchary	Seed	Paste, Powder, raw	Oral	throat infections, fever, common cold, to generate heat	Khuroo *et al.* 2007, Rashid *et al.* 2007, Sharma & Singh 1989
Thymus vulgaris L. Lamiaceae	Van jawain	Leaves, whole plant	Powder	Oral	Diarrhea, stomachache	Khateeb *et al.* 2015
Tinospora cordifolia (Willd.) Hook. f. & Thomson Menispermaceae	Garoh	Whole plant	Raw, mixture	Oral	Galactagogue, weakness, cough, blood in excreta	Sharma *et al.* 2012
Toona hexandra (Wall.) M. Roem. Meliaceae		Stem bark	Mixture	Oral	Diarrhea, Dysentery	Ahmad *et al.* 2017

Trachyspermum ammi (L.) Sprague Apiaceae	Ajwain	Fruit, seeds	Powder, Raw, paste	Oral, Topical	Diarrhea, indigestion, fever, pyrexia, appetizer, weakness, galactagogue, constipation	Khateeb *et al.* 2015, Sharma *et al.* 2012
Trifolium alexandrinum L. Fabaceae	Shatala	Whole plant	Raw	Oral	Constipation	Sharma *et al.* 2012
Trifolium pratense L. Fabaceae	Batakh loot, Burseem, Batakpanj	Whole plant	Raw	Oral	Galactagogue	Ahmad *et al.* 2017, Dar *et al.* 2018, Mir 2014
Trifolium repens L. Fabaceae	Chatbaut, BatakPanj	Whole plant, aerial part	Raw	Oral	Galactagogue	Ahmad *et al.* 2017, Sofi *et al.* 2019, Dar *et al.* 2018
Trigonella foenum-graecum L. Fabaceae	Meth	Leaves, flower, seed	Raw, paste	Oral	Diarrhea, fever, abortion	Sofi *et al.* 2019, Ahmad *et al.* 2017, Sharma *et al.* 2012, Khateeb *et al.* 2015
Trillium govanianum Wall. ex D. Don Melanthiaceae	Surmg&a, Reech Ki Jadi	Rhizome	Soft balls	Oral	Worms	Bhardwaj *et al.* 2013
Triticum aestivum L. Poaceae	Gehun, Kanik	Seed	Powder, Raw	Oral, Topical	Retention of placenta, weakness, galactagogue, Improvement in health	Sharma *et al.* 2012, Sofi *et al.* 2019
Ulmus villosa Brandis ex Gamble Ulmaceae	Manu	Leaves	Mixture	Oral	Prolapse	Dutta *et al.* 2021a
Urtica dioica L. Urticaceae	Soi, kayari	Rhizome, aerial part	Powder, paste, raw	Oral, Topical	Hematuria, joint pain, sterility, galactagogue	Khateeb *et al.* 2015, Sofi *et al.* 2019, Dar *et al.* 2018, Dutta *et al.* 2021
Valeriana jatamansi Jones ex Roxb Caprifoliaceae	Mushki-bala	Rhizomes	Powder	Oral	Muscular pain, dryness, reddening of eyes	Khuroo *et al.* 2007
Verbascum thapsus L. Scrophulariaceae	Gidar tambaku, Wan-tamook, Honi tamokh	Aerial part, Whole plant	Paste, decoction, raw, powder	Oral	Pyrexia, loose motion, flatulence, stomachache	Rashid *et al.* 2007, Khuroo *et al.* 2007, Sharma & Singh, 1989, Khateeb *et al.* 2015
Viburnum grandiflorum Wall. ex DC. Adoxaceae	Surnai wool, Kulmanch, Talaanj, kilmish, Kuch, Kulanch	Fruits, leaves, root, twig, seeds, stem	Raw, paste, powder	Oral, Topical	Galactagogue, general weakness, respiratory problems, fodder, red water diseases, constipation, stomach ache, skin infection, constipation, wound, laziness	Dar *et al.* 2018, Sofi *et al.* 2019, Mir 2014, Sharma & Singh 1989, Manzoor & Ali 2017, Dutta *et al.* 2021a, Rashid *et al.* 2007, Rashid *et al.* 2007
Vicia lens (L.) Coss. & Germ. Fabaceae	Til	Seed	Raw	Oral	Galactagogue	Sharma *et al.* 2012
Vigna mungo (L.) Hepper Fabaceae	Mah Dal, Mung	Seed	Decoction, Raw	Oral	Facilitates the normal conception & eases the labor pain, galactagogue	Khuroo *et al.* 2007, Sharma *et al.* 2012

Vincetoxicum arnottianum (Wight) Wight Apocynaceae	Mehren	Leaves	Powder	Topical	Wounds	Rashid *et al.* 2007
Vincetoxicum hirsutum (Wall.) Kuntze Apocynaceae	Tripu	Stem	Latex	Topical	Conjunctivitis	Sharma & Manhas 2015, Sharma *et al.* 2012
Vitex negundo L. Lamiaceae	Bana	Leaves	Decoction, Paste, Raw	Oral, Topical	Cough, body pains, diarrhea, Stomachache, eye infection, snakebite, indigestion, pyrexia	Jamwal & Kant 2008, Sharma & Manhas 2015, Sharma *et al.* 2012, Khan & Kumar 2012, Khan & Paul 2017, Dutta *et al.* 2021a
Woodfordia fruticosa (L.) Kurz Lythraceae	Taaye	Leaves	Powder	Oral	Stomachache	Sharma *et al.* 2012
Zanthoxylum armatum DC. Rutaceae	Timru, Timer	Seed, whole plant, Fruits	Raw, paste, powder	Oral	Appetizer, blisters, digestive disorders, indigestion	Sharma *et al.* 2012, Jamwal & Kant 2008,
Zea mays L. Poaceae	Makki	Seeds, fruit	Raw, solution	Oral	Galactagogue, FMD	Sharma *et al.* 2012, Dutta *et al.* 2021
Zingiber officinale Roscoe Zingiberaceae	Adrak	Rhizome	Raw	Oral	Pneumonia, cold	Sharma & Manhas 2015, Sharma *et al.* 2012.
Ziziphus jujuba Mill. Rhamnaceae	Breyi	Leaves, fruit	Raw	Oral	General tonic, skin diseases	Ahmad *et al.* 2017

The most represented genera in the study were *Allium cepa* L., which was mentioned in 9 studies, followed by *Acorus calamus* L., *Aesculus indica* (Wall. ex Cambess.) Hook, *Allium sativum* L., *Viburnum grandiflorum* Wall. ex DC. (7 studies), *Angelica glauca* Edgew., *Cedrus deodara* (Roxb. ex D. Don) G. Don, *Malva neglecta* Wallr., *Taraxacum sect. Taraxacum* F.H. Wigg. and *Vitex negundo* L. (6 studies). The frequency and maximum mentions of these plants indicate their predominant usage by the local people and their effectiveness against livestock diseases in the study area.

Family Diversity

Among the plant species, most belonged to Asteraceae (16), followed by Fabaceae (15), Lamiaceae (14), Polygonaceae (14), Ranunculaceae (11), Poaceae (9), Moraceae (8), Solanaceae (8) and Apiaceae (7) (Fig 1). Asteraceae as the dominant family with the highest number of plants used to treat livestock diseases can be attributed to that it is the largest family in Jammu and Kashmir (Dar & Khuroo 2020). The dominance of Asteraceae in ethnoveterinary studies was also observed in several other studies (Bhatia *et al.* 2015, Kadir *et al.* 2014, Luo *et al.* 2022, Umair *et al.* 2017). Members of the Asteraceae are known to possess bioactive molecules having anti-inflammatory, antioxidant, and antibacterial activities (Bessada *et al.* 2015).

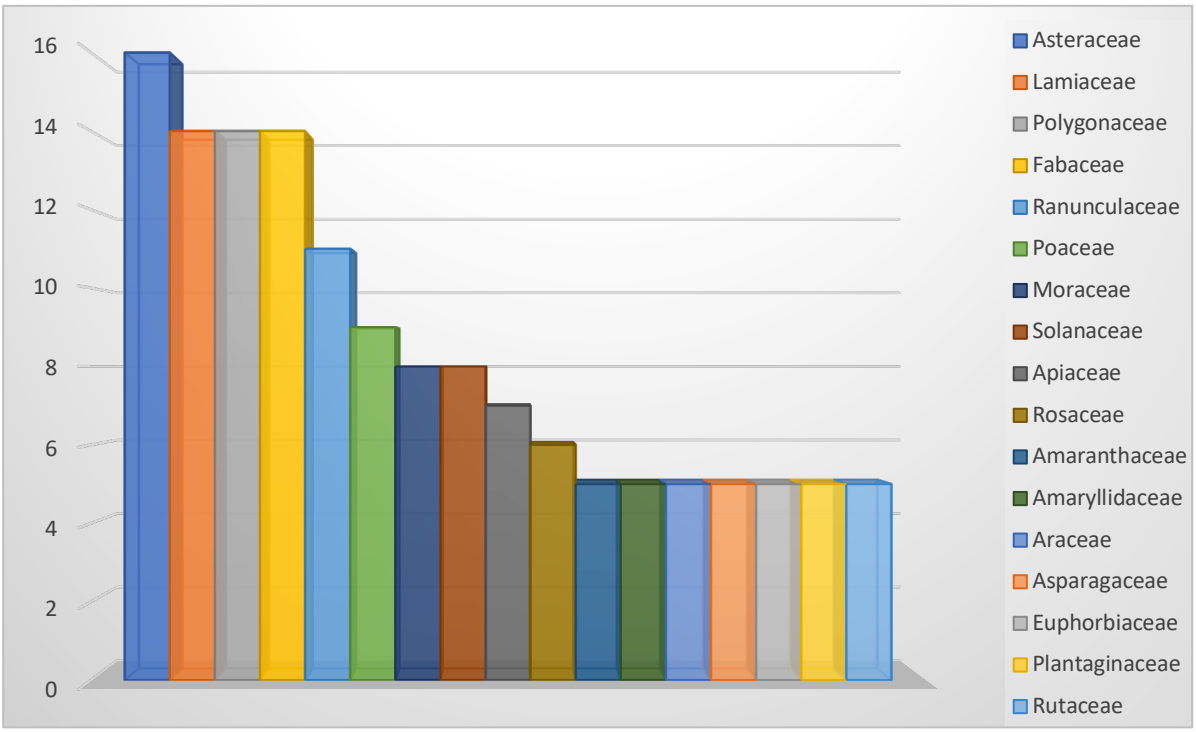

Figure 1. Plant species distribution in major families.

Part used

The literature review revealed that leaves (24.29%) were the most used plant part for preparation of traditional phyto-remedies followed by whole plant (16.29%), fruit (10%), root and seed (9.43% each), aerial part and rhizome (6% each), stem (5.71%), tuber (3.43%), flower (3.14%), stem bark (1.71%), bulb (1.43%), branches, latex, pulp and resin (0.57 % each), grains, oil and raw (0.29 % each)as depicted in Fig. 2. Leaves were preferred over any other part of the plant due to several reasons viz., ease of collection and access as compared to other parts like root and stem. Also, Leaves are the main storehouse of several secondary metabolites that are more concentrated in leaves (Ghorbani 2005). Roots were the preferred part after leaves as they are rich in terpenes (Silva *et al.* 2021). In terms of harvesting plant parts, sustainable measures should be adapted as the harvesting of underground part poses threat to the survival of the plant and also make it unavailable for long-term use (Chakale *et al.* 2021).

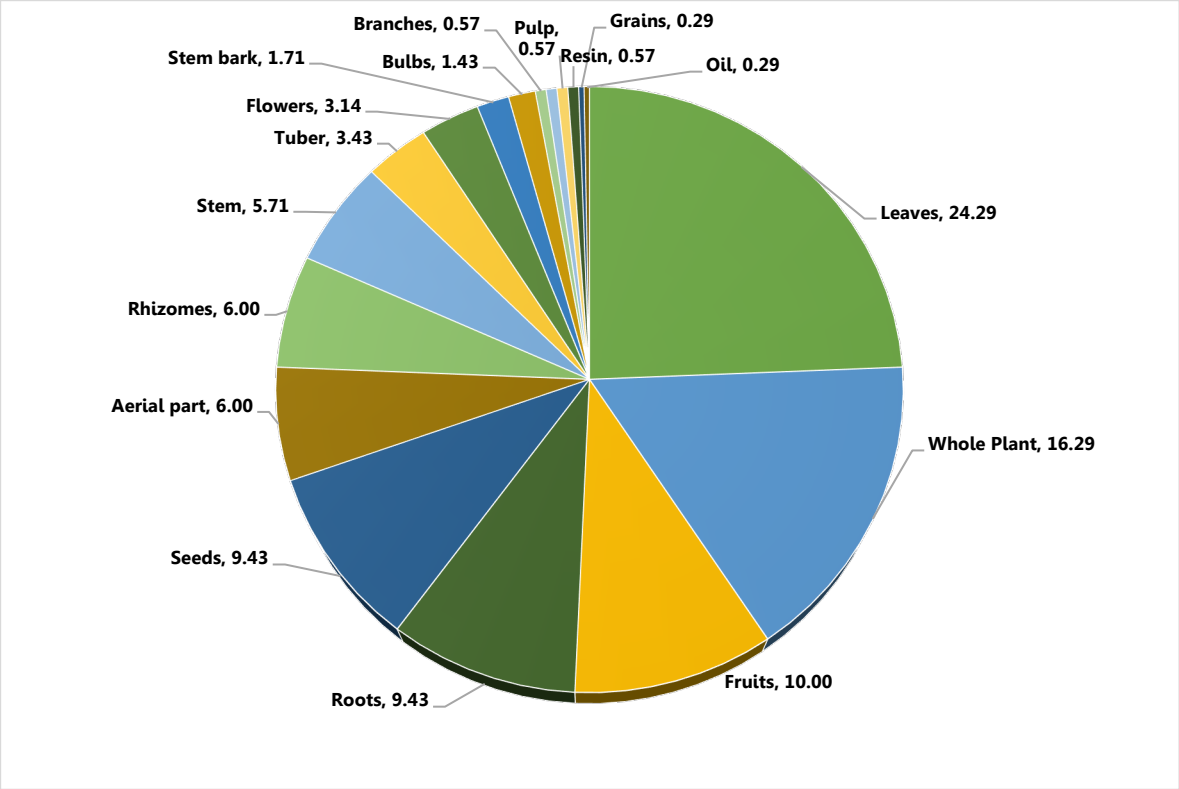

Figure 2. Plants parts used in remedies preparation

Mode of administration and usage form

Plant parts were subjected to different methods of preparation before using them depending upon the location and type of disease. The preferred mode of administration of the medicine was oral (76.94%). The oral administration route is preferred over topical as it allows fast, rapid distribution and interaction of the medicines with the target site inside the body (Chakale et al. 2021). A total of nineteen (19) different forms of plant products *viz.,* aqueous extract, bandage, cakes, decoction, infusion, juice, latex, mixture, oil, paste, pickle, powder, pudding, raw, residue, resin, smoke, soft balls, and solution were employed for the treatment of livestock diseases (Table 2).

Table 2. Forms of plant products used in animal treatments

Usage form	Percentage (%)
Raw	28.40
Paste	24.26
Powder	19.33
Decoction	7.89
Juice	5.52
Soft balls	5.13
Mixture	2.37
Solution	1.78
Oil	1.38
Aqueous extract	1.18
Cakes	0.59
Infusion	0.39
Latex	0.39
Smoke	0.39
Bandage	0.20
Pickle	0.20
Pudding	0.20
Residue	0.20
Resin	0.20

Among these usage forms, most of the plants or parts thereof (n=144);28.4%) were fed raw along with fodder followed by paste (123=24.26%), powder (98=19.33%), decoction (40=7.89%), and juice (28=5.52%). The popularity of the parts being fed raw attributes to the belief of the herbalists that fresh plant parts are rich in the concentration of secondary metabolites as compared to dried ones, thus exhibiting high efficacy against diseases (Lulekal *et al.* 2014). However, these results differ among several other studies in terms of mode of application. (Lulekal *et al.* 2014, Prakash *et al.* 2021)

Livestock diseases and treatment

A total of 134 livestock diseases were reported from the study area including wounds, indigestion, snake bite, weakness, diarrhea, cold, foot and mouth disease, cold, fever, cough, stomach-ache, etc. (Fig 3). Plant species having galactagogue (plants used to increase milk production in animals) properties were *Angelica glauca, Viburnum grandiflorum, Vitex negundo, Brassica rapa, Geranium wallichianum* and several other plant species. Four species (*Angelica glauca, Phyllanthus emblica, Viburnum grandiflorum* and *Vitex negundo*) were used to treat the highest number of disease (11), followed by *Allium cepa, Allium sativum* (10), *Aesculus indica,* and *Geranium wallichianum* (11 each).

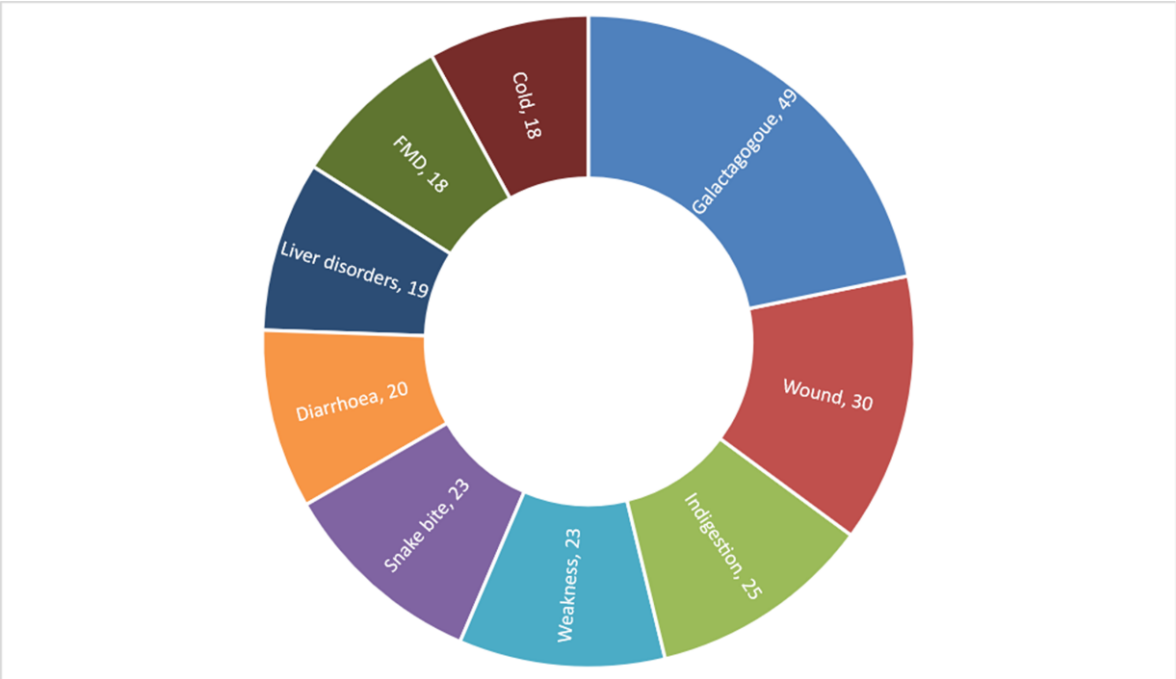

Figure 3. Most common ailments in animals treated with ethnoveterinary medicines and number of plant species

Conclusion

Owing to its diverse cultural heritage and biodiversity, Jammu and Kashmir possess rich traditional knowledge of ethnoveterinary plants used to mitigate livestock diseases. Despite trends often limiting traditional knowledge maintenance like urbanization and verbal transmission through generations, these practices are still prevalent among the ethnic communities which is attributed to the inaccessibility of the cattle owner to modern healthcare facilities. Regardless of the prevalence of these practices, there is a steep decline in the use of plants in livestock healthcare practices which are declining at an accelerated rate due to lack of interest of the younger generation, popularity of allopathic medicines, death of elder members of the family without transmitting or documenting their ethnoveterinary knowledge, etc. Although our review found 246 useful plant species, it was observed that most of the reviewed studies lacked important parameters like a diagnosis of disease, usage form, route of administration, parts used, dosage, and side-effects of the remedy. This fragmented knowledge on ethnoveterinary plants calls for holistic, well-planned documentation of the data and its validation using quantitative indices and pharmacological assays. The proper validation of the documented remedies will further lead to the addition of novel entities into the existing drug pools and also the production of new veterinary drugs from these resources. The integration of the reported plants into the biodiversity registers and promotion of this traditional heritage by the concerned government institutions and stakeholders involved in conservation is the utmost need of the hour which will ultimately result in the conservation of both the traditional knowledge as well as local biodiversity.

Declarations

List of abbreviations: Not applicable
Ethics approval and consent to participate: Not applicable - this is a literature review.
Consent for publication: Not applicable
Availability of data and materials: Data are available from the corresponding author.
Conflict of interest: The authors declare that they have no conflict of interest.
Author Contributions: AD conceptualized the work under the guidance of YPS and BS. AD retrieved the data, analyzed it and prepared the draft of the manuscript. YPS and BS reviewed and edited the manuscript. RWB reviewed, edited and revised the manuscript.
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