Plant-based veterinary practices in Peru: a review of traditional ethnoveterinary knowledge and phytochemical components

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Review

Abstract

Background: For millennia, medicinal plants have been employed in ethnoveterinary practices to cure and avert diseases in domesticated animals, particularly livestock. Ethnoveterinary medicine studies traditional beliefs, knowledge and practices to maintain the health and well-being of animals, using mainly plants, minerals, animals and magical-religious or spiritual elements in prevention, diagnosis, treatment and healing. In Peru, the trend of urban migration has led to a decline in traditional knowledge regarding the use of medicinal plants in veterinary treatment. This study aims to pinpoint the medicinal plants traditionally employed in Peru and to identify their phytochemical makeup.

Methods: A comprehensive literature review was conducted using various online databases, including Google Scholar, Web of Science, ResearchGate, Scopus, ScienceDirect, university databases and other related publications.

Results: In total, 13 studies were found that refer to the use of medicinal plants in ethnoveterinary medicine in Peru. The studies recorded a total of 189 plant species from 61 families, used in treating a variety of diseases in Peruvian domestic animals. In ethnoveterinary medicine, a total of 58 conditions were identified, primarily in livestock and alpacas. The most frequently observed conditions were diarrhea (23%), fever (13%), worm infestation (10%), pneumonia (8%), and mastitis (7%). Among the 189 species used in Peruvian ethnoveterinary medicine, 69% have studies on their phytochemical components listed in the databases. The most important phytochemical compounds found were simple and complex phenolic compounds, essential oils, including simple and complex terpenes. Other less frequent were phytosterols, alkaloids, glycosides, quinones and peptides.

Conclusions: Studies on ethnoveterinary medicine in Peru document 181 plant species used in the treatment of ailments in cattle, llamas and alpacas, mainly. The most common diseases include diarrhea, fever and mastitis. Approximately 69% of these plants have been studied for their phytochemical content, were found mainly polyphenols, oils, alkaloids, quinones and peptides. While for the rest of the plants there is no record of their components, which represents an opportunity for future research.

Keywords: Ethnoveterinary, livestock, medicinal plants, phyto-remedies, Peru.

Background

Medicinal plants have been widely used throughout history in ethnoveterinary medicine all over the world (Calzetta *et al*. 2020) The inception of veterinary practices can be traced back over 14 000 years, coinciding with the period of animal domestication. These plants were deployed in the treatment and prevention of numerous diseases, infections, and infestations in domesticated animals, with a particular focus on livestock (Cáceres *et al*. 2022; Bardales *et al*. 2020).

Throughout the course of history, therapeutic plants have played a crucial part in ethnoveterinary medicine around the globe (Calzetta *et al*. 2020). Ethnoveterinary medicine can be defined as an interdisciplinary field dedicated to the study of traditional, popular and local veterinary medicine, which comprises beliefs, knowledge and practices to maintain the health (prevention, diagnosis, treatment and healing) and well-being of animals and includes mainly plant elements, as well as mineral, animal and magical-religious or spiritual elements (Wanzala *et al*. 2005; Akerreta *et al.* 2010; Cáceres *et al*. 2022).

Medicinal plants harbor a diversity of secondary metabolites that play a crucial role in their therapeutic properties (Xu *et al*. 2021; Hosseini Shekarabi *et al*. 2021). These secondary compounds, acting synergistically, are responsible for the beneficial antioxidant function observed in medicinal plants (Cortés *et al*. 2014). In this context, veterinary phytotherapy, an approach that employs medicinal plant extracts and essential oils, is used to prevent and treat diseases in animals. Although the therapeutic use of phytopharmaceuticals is more common in human medicine, their application in animal health is still limited. However, natural products derived from medicinal plants have shown efficacy in the treatment of animal conditions. Studies support the potential of medicinal plants as antiparasitic, anti-inflammatory and antimicrobial agents (Sipahi *et al*. 2022; Zoral *et al*. 2017; Bortoluzzi *et al*. 2021).

Infectious diseases are aggravated by antimicrobial drug resistance and the formation of resistant biofilms in the treatment of bacterial infections. Thus, the rate of multidrug resistance of pathogenic bacteria to existing antimicrobials increased considerably in the last decade (Sipahi *et al*. 2022). Similarly, anthelmintic resistance is a worldwide concern in the small ruminant sector (Bezerra *et al*. 2023; Štrbac *et al*. 2023). Numerous investigations into antimicrobial resistance in various countries have discovered a growing trend in pathogen resistance to administered medicines, fluctuating from region to region, with implications for treatment costs (Kebede & Shibeshi 2022). In this perspective, the pharmacological potential of alternative medicines from various plants is being studied, as secondary metabolites have fewer side effects, less likelihood of generating microbial resistance and less production of waste to the environment (Sampieri *et al*. 2013; Kebede & Shibeshi 2022; Abo-EL-Sooud 2018; Nazir *et al*. 2021; Ghosh *et al*. 2013).

In Peru, information on the use of medicinal plants in ethnoveterinary medicine is scarce. This deficit is mainly attributed to migration to the cities, which has led to a significant loss of traditional knowledge related to the use of plants to treat animal ailments (Bardales *et al*. 2020). In addition, the availability of scientific studies that address the phytochemical composition, uses and trials that support the use of medicinal plants in veterinary medicine is limited. In this context, the objective of this work was to identify medicinal plants of traditional use in Peru and to show studies that address their phytochemical composition.

Materials and Methods

The present study was based on the systematic review of ethnoveterinary studies conducted and published in the Peruvian territory. In addition, a review was made of the phytochemical components of plants used in ethnoveterinary medicine, considering research conducted between 2004 and 2024. The data were collected through databases such as Google Scholar, Web of Science (WOS), Researchgate, Scopus, Science Direct, and the repositories of Peruvian universities. For the identification of plants used in ethnoveterinary medicine, keywords such as ethnoveterinary, ethnomedicine, traditional medicine in animal were used. In the identification of the phytochemicals, Boolean operators were used, combining the scientific name of each plant with veterinary sciences, composition, phytochemicals and use in animals. For taxonomic correction and authentication of plant species names, reference was made to Plants of the World Online (powo.science.kew.org).

Results

Knowledge of ethnoveterinary medicine

Thirteen research studies on plants used in ethnoveterinary medicine were identified. These studies involve plants that grow in the three natural regions (Coast, Highlands and Jungle) of the Peruvian territory. A total of 189 plant species were recorded, distributed in 61 families, which are used to treat various diseases and disorders common in domestic animals in Peru. The

five families with the most species recorded for the treatment of conditions in ethnoveterinary medicine were Asteraceae (21 species), Fabaceae (21 species), Lamiaceae (14 species), Euphorbiaceae (5 species) and Poaceae (5 species) (Table 2). Fifty-eight diseases were recorded in ethnoveterinary medicine in Peru, most of them related to bovine, llama (*Lama glama*), vicuna (*Vicugna vicugna*) and alpacas (*Vicugna pacos*). Among these conditions, 16 were the most common, with a presence of more than 3%. The five most frequent conditions were diarrhea (17%), fever (9%), worm infestation (7%), pneumonia (6%) and mastitis (5%) (Table 1).

Table 1. Diseases treated in ethnoveterinary medicine in Peru.

Disease	Percentage
Diarrhea	17
Fever	9
Worms	7
Pneumonia	6
Mastitis	5
Internal parasites	4
Lice	3
Blow	3
Plague	3
Tick disease	3
Indigestion	3
Scabies	2
Pyroplasmosis	2
Inflammation	2
Wound	2
Ruminal atony	2
Other diseases	27

The parts of the plant used varied depending on the condition treated. Leaves were the most frequently used (42%), followed by the aerial part (leaves + stem + flowers) (16%), the whole plant (14%), the fruit (8%), the root (4%) and the stem (4%). There were also cases in which seeds, bark, flowers and latex were used (Figure 1). Leaves were the most utilized part of the plant due to several reasons, mainly because of the ease of harvesting. In addition, the leaves act as the main storehouse of various secondary metabolites, which are found in higher concentrations in this part of the plant (Szypuła *et al*. 2024). Regarding the harvesting of the different parts of the plant, it is essential to adopt sustainable measures, as the extraction of subway parts represents a threat to the survival of the plant and limits its availability for long-term uses (Seminario-Cunya *et al*. 2016).

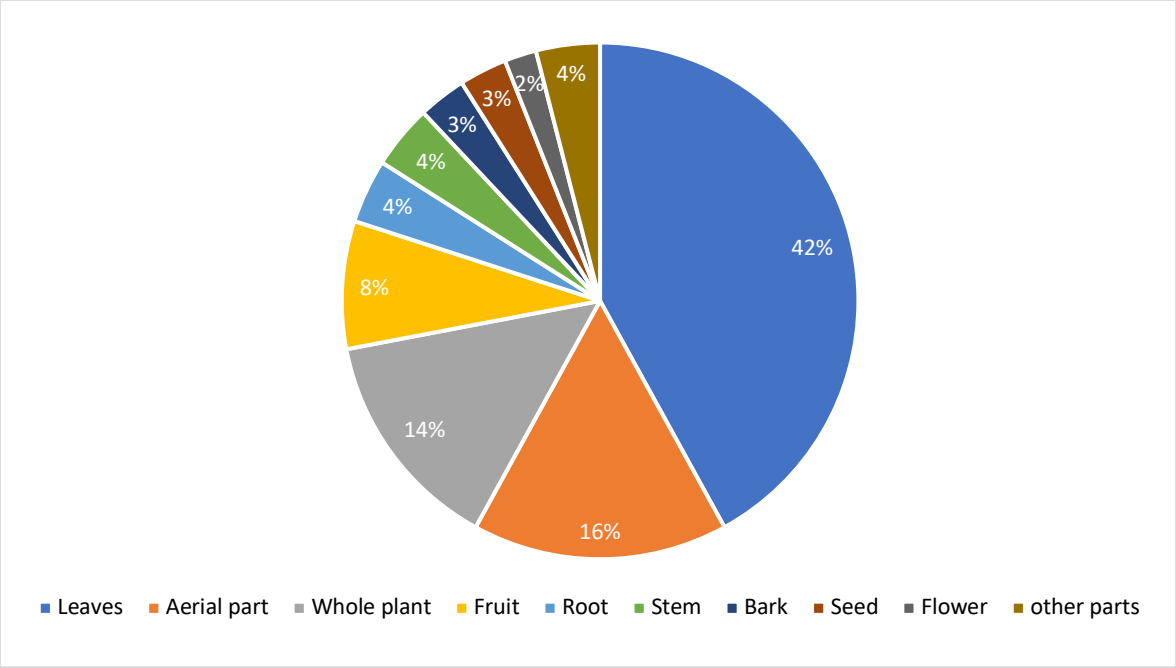

Figure 1. Parts of the plant used in ethnoveterinary medicine.

The plants were prepared in various ways. The most common way was infusion (37%), followed by decoction (22%), use of fresh plants (19%) and preparation in the form of juice (5%). Other less frequent techniques included liquefying, grinding, fermenting, crushing, macerating and others (Figure 2). The main routes of administration were oral, topical and dermal.

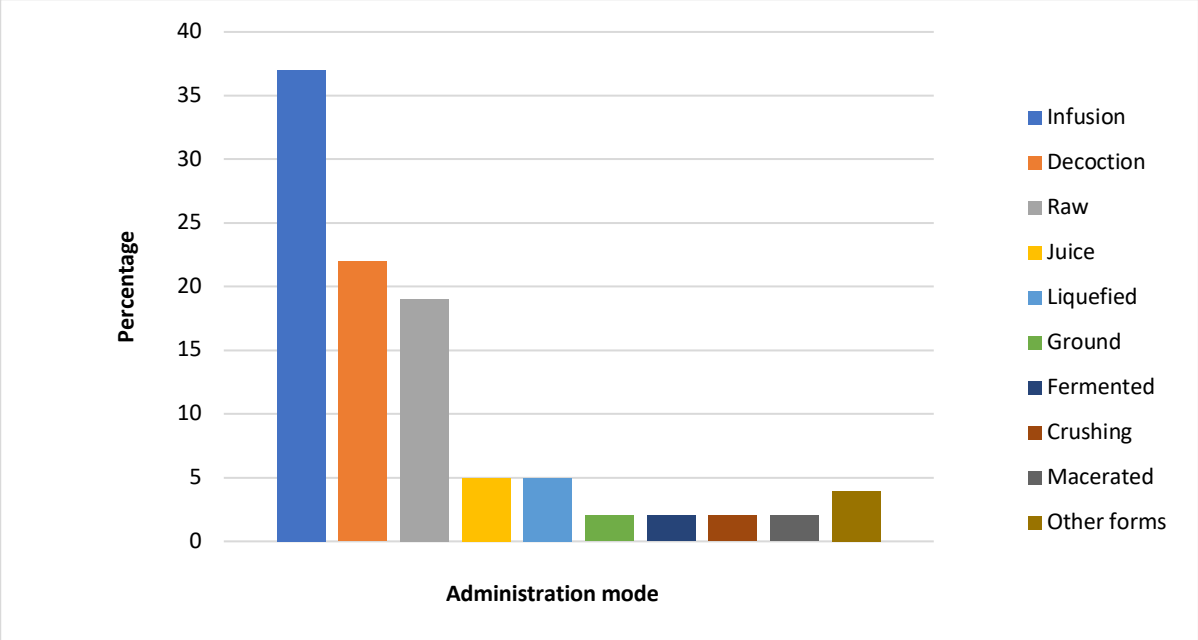

Figure 2. Preparation methods for plants used in ethnoveterinary medicine.

Phytochemical constituents found in the plants under study

Of the 189 plant species reported with uses in ethnoveterinary medicine in Peru, 74% have studies on their phytochemical components (Table 3). The seven species with the most information available in databases on their phytochemical components and studies carried out in veterinary medicine were: *Artemisia absinthium*, *Opuntia ficus-indica, Allium sativum, Carica papaya, Chenopodium ambrosioides, Jatropha curcas, Medicago sativa, Melissa officinalis* and *Rosmarinus officinalis.*

Among the most abundant phytochemicals reported in these plants are phenolic compounds, from their simple forms to polyphenols, the latter being the most relevant. Polyphenols include a variety of compounds such as flavonoids, phenylpropanoids, xanthones, and phenolic acids. Flavonoids include isoflavonoids, leucoanthocyanidins, chalcones, kaempferol, quercetin, anthocyanins and tannins. Among the phenolic acids identified were caffeic, coumaric, rosmarinic, chlorogenic, ferulic and quinic acids. Essential oils were also abundant, with simple and complex terpenes (eucalyptol, farnesol, camphor, pinenol) standing out in their composition. Other less frequent compounds were phytosterols, alkaloids, glycosides, quinones and peptides.

Table 2. Medicinal plants used in ethnoveterinary medicine in Peru

Species	Local name	Family	Disease	Animal	Parts used	Usage form	Administration mode	References
***Acaulimalva alismatifolia* (K. Schum. & Hieron.) Krapov.**	Flor blanca	Malvaceae	Fever	Bovine	Leaves	Crushing	Oral	Apaéstegui 2023
***Achyrocline alata* (Kunth) DC.**	Huira huira, vira vira, oqe, qora,	Asteraceae	Mastitis, lameness	Bovine	Leaves; aerial part	Smoothie, infusion	Poultice, oral	Bardales *et al*. 2020
			Blow, injury	Bovine	Leaves	Raw	Poultice	Castañeda 2019
Agave americana* subsp. *americana	Cabuya, paqpa, maguey	Asparagaceae	Distemper	Pig	Leaves	Juice	Oral	Castañeda 2019
***Ageratina glechonophylla* (Less.) R.M.King & H.Rob.**	Guarme guarme	Asteraceae	Worms, infestation, diarrhea	Bovine	Flower, Leaves	Fresh, infusion.	Dermal, oral.	Bardales *et al*. 2020
***Ageratina sternbergiana* (DC.) R.M.King & H.Rob.**	Marmakilla, yana warmi	Asteraceae	Digestive tract cleaning	Bovine	Stem, leaves	Juice	Oral	Castañeda 2019
***Ageratum conyzoides* L.**	Subsacha blanca	Asteraceae	Diarrhea	Bovine	Stem, leaves	Infusion, smoothie	Poultice, oral	Bardales *et al*. 2020
***Airampoa soehrensii* (Britton & Rose) Lodé**	Airampo	Cactaceae	Fever, evil eye	Bovine	Seed	Infusion	Oral, topical	Bardales *et al*. 2020
***Alchemilla pinnata* Ruiz & Pav.**	Sillo sillo	Rosaceae	Inflammation	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Allium cepa* L.**	Cebolla	Amaryllidaceae	Colic	Llama and vicuna	Bulb	Juice	Oral	Quiso 2014
***Allium sativum* L.**	Ajo	Amaryllidaceae	Pneumonia, scabies	Llama and vicuna	Bulb	Juice, macerated	Oral, topical	Quiso 2014
***Alnus acuminata* Kunth**	Aliso	Betulaceae	Pneumonia, diarrhea, scabies	Bovine	Bark, leaves	Decoction, raw, infusion, smoothie	Dermal, oral.	Bardales *et al*. 2020
			Plague	Bovine	Bark	Decoction	Oral	Burga 2021
***Aloe vera* (L.) Burm.f.**	Penca sábila, sábila, aloe	Asphodelaceae	Plague, mastitis, diarrhea, ticks, scabies, rumen atony, tympanism, wound healing.	Bovine	Leaves, aerial part	Raw, infusion, fermented, decoction	Dermal oral, poultice	Bardales *et al.* 2020

***Alternanthera mexicana* Moq.**	Lancetilla de huerta	Amaranthaceae	Mastitis, piroplasmosis, worsms infestation.	Bovine	Leaves, aerial part	Decoction, infusion, juice, decoction.	Dermal, oral	Bardales *et al*. 2020
***Alternanthera porrigens* (Jacq.) Kuntze**	Lancetilla de campo	Amaranthaceae	Pneumonia, mastitis, worm infestation, scab, rumen atony.	Bovine	Leaves, aerial part	Infusion, decoction	Oral, baño	Bardales *et al*. 2020
***Alternanthera pungens* Kunth**	Ojo de pollo	Amaranthaceae	Indigestion, disinfection of rearing site	Poultry	Whole plant	Infusion	Oral	Burga 2016
***Ambrosia arborescens* Mill.**	Marco grande, marco	Asteraceae	Pneumonia, ticks, lice, horsefly bites, ruminant atony.	Bovine	Leaves, whole plant	Infusion, raw, smoothie, heated, decoction	Dermal	Bardales *et al*. 2020
			Inflammation	Bovine	Stem, leaves	Decoction	Dermal	Díaz 2023
***Ambrosia cumanensis* Kunth**	Alta misa	Asteraceae	Diarrhea	Llama and vicuna	Whole plant	Infusion	Oral	Quiso 2014
***Annona cherimola* Mill.**	Chirimoya	Annonaceae	Stomatitis, diarrhea	Bovine	Leaves	Raw, infusion	Dermal, oral	Bardales *et al*. 2020
***Arracacia peruviana* (H.Wolff) Constance**	Arracacha de zorro	Apiaceae	Placenta expulsion	Bovine	Stem, leaves	Decoction	Oral	Díaz 2023
***Artemisia absinthium* L.**	Ajenjo, ajinku	Asteraceae	Pneumonia, ticks disease, warts	Bovine	Leaves, whole plant	Raw, infusion, smoothie	Oral, dermal	Bardales *et al*. 2020
			Internal parasites	Sheep	Leaves	Infusion	Oral	Mathez-Stiefel *et al*. 2018
***Azorella compacta* Phil.**	Yareta, temillo	Apiaceae	Scabies, lice, fever	Alpaca	Aerial part	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Internal parasites	Llama and vicuna	Whole plant	Decoction, ash	Oral, topical	Quiso 2014
***Baccharis genistelloides* (Lam.) Pers.**	Carqueja, tres esquinas	Asteraceae	Plague, lameness	Bovine	Leaves	Decoction, raw, infusion	Oral, dermal	Bardales *et al*. 2020
***Baccharis latifolia* Pers.**	Chilca, chilco, chillka	Asteraceae	Mastitis, lice	Bovine	Leaves	Infusion, raw	Oral, dermal	Bardales *et al*. 2020

			Cleaning of microbes	Bovine	Stem, leaves	Infusion	Dermal	Díaz 2023
			Fracture, inflammation	Llama and vicuna	Whole plant	Infusion	Oral, dermal	Quiso 2014
***Baccharis tricuneata* (L.f.) Pers.**	T' ola	Asteraceae	Internal parasites, diarrhea, fever.	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Banisteriopsis caapi* (Spruce ex Griseb.) C.V.Morton**	Ayahuasca	Malpighiaceae	Digestive tract cleaning	Bovine	Bark	Raw, fermented	Oral	Burga 2016
***Beta vulgaris* L.**	Beterraga	Amaranthaceae	Piroplasmosis, lactation	Bovine	Fruit, leaves	Decoction, raw, juice, infusion	Oral, dermal	Bardales *et al*. 2020
***Bidens andicola* Kunth**	Misiku	Asteraceae	Diarrhea, cold, pneumonia	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Bidens pilosa* L.**	Cadillo	Asteraceae	Estomatitis	Bovine	Aerial part	infusion	Oral	Bardales *et al*. 2020
***Bixa orellana* L.**	Achiote	Bixaceae	Mycosis	Pigs and poultry	Fruit	Raw, infusion	Dermal	Burga 2016
***Brassica rapa* L.**	Nabo	Brassicaceae	Fever	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Fever, pyosepticemia, blows	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Buddleja incana* Ruiz & Pav.**	Kishuara	Scrophulariaceae	Fasciola hepatica	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Campsiandra angustifolia* Spruce ex Benth.**	Huacapurana	Fabaceae	Diarrhea	Pig and dog	Bark	Fermented	Oral	Burga 2016
***Canna indica* L.**	Achira	Cannaceae	Pneumonia, scabies	Bovine	Aerial part, shoot, root	Infusion, juice	Oral	Bardales *et al*. 2020
***Capsella bursa-pastoris* (L.) Medik.**	Bolsa del pastor	Brassicaceae	Stomatitis, diarrhea	Bovine [1] Guinea pig[2]	Aerial part, leaves, root	Raw, infusion	Oral, dermal	Bardales *et al*. 2020[1] Castañeda 2019[2]
***Capsicum annuum* L.**	Ají	Solanaceae	Breeding site disinfection	Bovine	Fruit	Raw	N/A	Burga 2016

***Capsicum pubescens* Ruiz & Pav.**	Rocoto	Solanaceae	Disinfection of dog bites	Bovine	Fruit	Ground	Dermal	Díaz 2023
***Carica papaya* L.**	Papaya	Caricaceae	Internal parasites	Bovine	Leaves	Raw	N/A	Burga 2016
			Pyroplasmolysis, mastitis, scabies	Bovine	Fruit, latex, stem	Raw, juice, infusion, smoothie	Oral, dermal	Bardales *et al*. 2020
***Ceroxylon peruvianum* Galeano, Sanín & K.Mejia**	Chonta	Arecaceae	Scabies	Bovine	Bark	Fermented	Oral	Bardales *et al*. 2020
***Cervantesia tomentosa* Ruiz & Pav.**	Pica pica	Santalaceae	Wound	Pig, bovine	Leaves	Ground	topical	Díaz 2023
***Cestrum affine* Kunth**	Hierba santa negra	Solanaceae	Swelling, fever	Bovine	Leaves	N/A	Oral	Burga 2021
***Cestrum auriculatum* L'Hér.**	Hierba santa, hierba santa negra	Solanaceae	Pneumonia, anthrax, tick disease	Bovine	Leaves	Infusion, juice, decoction	Oral, topical	Bardales *et al*. 2020
			Swelling	Bovine	Leaves	Ground	Dermal	Apaéstegui2023
***Cestrum tomentosum* L.f.**	Hierba santa blanca	Solanaceae	Swelling	Bovine	Leaves	Ground	Dermal	Apaéstegui 2023
***Chenopodium pallidicaule* Aellen**	Cañihua, ramillita, cañihua roja	Amaranthaceae	Diarrhea, stomatitis, fever	Llama and vicuna	Seed, whole plant	Soup	Oral	Quiso 2014
***Chersodoma jodopappa* (Sch.Bip.) Cabrera**	Janq'o t'ola	Asteraceae	To chase away the disease	Llama and vicuna	Whole plant	Burn	topical	Quiso 2014
***Chuquiraga webervaueri* Tovar**	Amaro, amarro	Asteraceae	Fasciola hepatica		Leaves	Infusion	Oral	Sánchez-Vega & Dillon 2006
***Cichorium intybus* L.**	Achicoria	Asteraceae	Diarrhea, Fasciola hepatica	Bovine	Leaves, aerial part, root	Decoction, infusion	Oral, enema	Bardales *et al*. 2020)
***Citrus limon* (L.) Osbeck**	Limón	Rutaceae	Fever, stomatitis		Fruit	Juice, ash	Oral, topical	Sánchez-Vega & Dillon 2006
***Citrus x paradisi* Macfad**	Toronja	Rutaceae	Bronchitis, flu	Bovine	Fruit	Raw, infusion	Oral	Burga 2016
***Columellia obovata* Ruiz & Pav.**	Piska piska	Columelliaceae	Fasciola hepatica	Bovine	Branch	Juice, decoction	Oral, dermal	Castañeda 2019
***Commelina erecta* L.**	Lancetilla	Commelinaceae	Indigestion	Poultry and dog	Leaves	Raw	Topical	Burga 2016
***Costus erythrocoryne* K.Schum.**	Caña agria	Costaceae	Bronchitis, inflammation	Poultry	Whole plant	Raw	N/A	Burga 2016

***Couroupita guianensis* Aubl.**	Ayahuma	Lecythidaceae	Breeding site disinfection	Poultry	Leaves, fruit	Raw	N/A	Burga 2016
***Croton lechleri* Müll.Arg.**	Sangre de grado	Euphorbiaceae	Wound healing	Bovine	Latex	Fermented	Topical	Burga 2016
***Cumulopuntia boliviana* (Salm-Dyck) F.Ritter**	Huaraco, phuskallaya	Cactaceae	Fever, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Diarrhea	Llama and vicuna	Fruit	Decoction	Oral	Quiso 2014
***Cydonia oblonga* Mill.**	Membrillo	Rosaceae	Diarrhea	Llama and vicuna	Fruit	Infusion	Oral	Quiso 2014
***Cynodon dactylon* (L.) Pers.**	Grama dulce	Poaceae	Diarrhea	Bovine	Stem	Decoction	Oral	Bardales *et al*. 2020
***Dalea pazensis* Rusby**	Chinan qera	Fabaceae	Blows, infection	Bovine	Whole plant	Decoction	Dermal	Castañeda 2019
			Blows	Bovine	Whole plant	Decoction	Dermal	Castañeda 2019
***Daucus carota* L.**	Zanahoria	Apiaceae	Fever		Root	Juice	Oral	Sánchez-Vega & Dillon 2006
***Desmodium molliculum* (Kunth) DC.**	Pie de perro	Fabaceae	Fasciola hepatica	Bovine	Leaves	Smoothie	Topical	Bardales *et al*. 2020
***Distichia muscoides* Nees & Meyen**	Huallata chaqui	Juncaceae	Diarrhea	Alpaca	N/A	N/A	N/A	Gutierrez-Flores *et al*. 2023
			Internal parasites	Cat, dog	Whole plant	Infusion	Oral	Burga 2021
			Parasites	Pig	Leaves	Raw, macerated	Oral	Burga 2016
***Dysphania ambrosioides* (L.) Mosyakin & Clemants**	Paico, paiqo	Amaranthaceae	Pneumonia, alicuya, tick disease	Bovine	Aerial part, leaves, root	Infusion, decoction, raw, smoothie	Oral, dermal	Bardales *et al*. 2020
			Diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Colic, diarrhea, internal parasites, colds		Whole plant	Decoction	Oral	Sánchez-Vega & Dillon 2006

			Galactogen	Bovine	Leaves	Ground	Oral	Apaéstegui 2023
			Urinary tract infection, fever, pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Echeveria eurychlamys* (Diels) A.Berger**	Pimpín	Crassulaceae	Galactogen	Bovine	Leaves	Ground	Oral	Apaéstegui 2023
***Ephedra americana* Humb. & Bonpl. ex Willd.**	Pinqo pinqo, pinku pinku	Ephedraceae	Urinary tract infection, fever, pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Equisetum bogotense* Kunth**	Cola de caballo	Equisetaceae	Piroplasmosis, worm infestation	Bovine	Leaves	Decoction, infusion, smoothie	Oral, dermal	Bardales *et al*. 2020
***Equisetum giganteum* L.**	Cola de caballo	Equisetaceae	Mastitis, worm infestation	Bovine	Leaves, stem, aerial part	Infusion, decoction	Oral	Bardales *et al*. 2020
***Erodium cicutarium* (L.) L'Hér.**	Muni muni	Geraniaceae	Fever	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Erythrina edulis* Triana ex Micheli**	Pajuro	Fabaceae	Mastitis	Bovine	Bark	Infusion	Oral	Bardales *et al*. 2020
***Erythroxylum coca* Lam.**	Coca	Erythroxylaceae	Mastitis	Bovine	Leaves	Infusion	Oral	Bardales *et al*. 2020
			Blows, diarrhea	Llama and vicuna	Leaves	Decoction	Oral	Quiso 2014
***Escallonia pendula* (Ruiz & Pav.) Pers.**	Chillaca brava	Escalloniaceae	Plague, diarrhea	Bovine	Leaves	Infusion	Topical	Bardales *et al*. 2020
***Eucalyptus globulus* Labill.**	Eucalipto	Myrtaceae	Pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Bronchitis	Llama and vicuna	Leaves	Infusion	Oral	Quiso, 2014
***Euphorbia laurifolia* Juss. ex Lam.**	Lechecaspi, nunumia	Euphorbiaceae	Lactation	Bovine	Latex	Raw	Topical	Bardales *et al*. 2020
***Festuca chrysophylla* Phil.**	Iru Ichu	Poaceae	Fever	Llama and vicuna	Whole plant	Infusion	Oral	Quiso 2014
***Ficus insipida* Willd.**	Ojé	Moraceae	Parasites	Bovine	Leaves, fruit	Raw	N/A	Burga 2016

***Gamochaeta americana* (Mill.) Wedd.**	Lechuguilla	Asteraceae	Mastitis, scabies, horsefly bites	Bovine	Leaves, aerial part	Raw, juice	Topical oral	Bardales *et al*. 2020
***Gentiana prostrata* Haenke**	Penqa penqa	Gentianaceae	Pneumonia, stomach pain	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Geranium sessiliflorum* Cav.**	Ojotilla, wila layo	Geraniaceae	Pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Cold, pneumonia	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Gnaphalium viravira* Molina**	Wira wira	Asteraceae	Pneumonia, internal parasites, fever	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Gossypium barbadense* L.**	Algodón	Malvaceae	Birth assistance	Bovine	Leaves	Raw, infusion	Topical	Burga 2016
***Grindelia boliviana* Rusby**	Ch'irich'iri	Asteraceae	Blow, fracture, prolapse	Llama and vicuna	Leaves	Decoction	Topical	Quiso 2014
***Hedyosmum scabrum* (Ruiz & Pav.) Solms**	Chacor, anashca	Chloranthaceae	Lameness	Horse	Leaves	Decoction	Dermal	Díaz 2023
***Hordeum vulgare* L.**	Cebada	Poaceae	Diarrhea	Llama and vicuna	Seed	Soup	Oral	Quiso 2014
***Hura crepitans* L.**	Catahua	Euphorbiaceae	Mycosis, internal parasites	Dog	Seed, bark	Raw	Oral, Topical	Burga 2016
***Hypochaeris meyeniana* (Walp.) Benth. & Hook.f. ex Griseb.**	Chuku chuku	Asteraceae	Fracture, prolapse	Llama and vicuna	Whole plant	Infusion	Topical	Quiso 2014
***Jatropha curcas* L.**	Piñón	Euphorbiaceae	Digestive tract cleansing, diarrhea	Duck	Fruit	Raw, infusion	Oral	Burga 2016
***Juglans neotropica* Diels**	Nogal	Juglandaceae	Anthrax, piroplasmosis	Bovine	Leaves, aerial part	Raw, infusion	Dermal	Bardales *et al*. 2020
***Laennecia artemisiifolia* (Meyen & Walp.) G.L.Nesom**	Qata	Asteraceae	Internal parasites	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
Lathyrus oleraceus Lam.	Arveja	Fabaceae	Indigestion	Bovine	Seed	Soaking	Oral	Díaz 2023
***Lepechinia meyenii* (Walp.) Epling**	Salvia	Lamiaceae	Pneumonia, fracture, diarrhea		N/A	N/A	N/A	

***Leucheria daucifolia* (D.Don) Crisci**	Sasawi	Asteraceae	Internal parasites	Alpaca	Sheets	Ground	Topical	Mathez-Stiefel *et al*. 2018
			Internal parasites, fever, scabies, fracture, pneumonia, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Internal parasites, bronchitis, colds	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Linum usitatissimum* L.**	Linaza	Linaceae	Indigestion	Bovine	Seed	Ground	Oral	Díaz 2023
			Stomatitis, diarrea, lactation	Bovine	Stem, fruit, aerial part	Decoction, infusion	Oral	Bardales *et al*. 2020
***Lupinus ananeanus* Ulbr.**	Pampa qera	Fabaceae	Blow	Horse	Whole plant	Decoction	Dermal	Castañeda *et al*. 2017
***Lupinus brachypremnon* C.P.Sm.**	Qera	Fabaceae	Blow, fasciola hepatica	Bovine	Whole plant	Decoction, ground	Dermal, topical, oral	Castañeda *et al*. 2017
***Lupinus chlorolepis* C.P.Sm.**	Qera de altura, sallqa qera	Fabaceae	Indigestion	Horse	Whole plant	Decoction	Dermal	Castañeda *et al*. 2017
***Lupinus mutabilis* Sweet**	chocho, tarwi	Fabaceae	Lice	Bovine	Fruit	Decoction	Dermal	Díaz 2023
			Fasciola hepatica, lice	Bovine	Fruit	Decoction	Oral, dermal	Apaéstegui2023
***Malva arborea* (L.) Webb & Berthel.**	Malva cultivada	Malvaceae	Pneumonia, worm infestation, tick infestation, scabies, horsefly bites, rumen atony.	Bovine	Leaves, aerial part	Decoction, infusion, heated	Enema, oral, dermal, topical	Bardales *et al*. 2020
***Mansoa alliacea* (Lam.) A.H.Gentry**	Ajo sacha	Bignoniaceae	Indigestion, bronchitis, flu	Bovine, poultry, dog	Leaves	Raw	Topical	Burga 2016
***Maquira coriacea* (H.Karst.) C.C.Berg**	Capinurí	Moraceae	Fracture	Livestock, poultry, dog	Latex	Raw	Topical	Burga 2016
***Marrubium vulgare* L.**	Matico, oqe qora	Lamiaceae	Diarrhea	Alpaca	N/A	N/A	Dermal	Gutiérrez-Flores *et al*. 2023

			Blow	Bovine	Leaves	Raw	Topical	Castañeda 2019
***Matricaria chamomilla* L.**	Manzanilla	Asteraceae	Diarrhea, worm infestations, Indigestion ruminal atony, tympanism	Bovine	Whole plant, leaves, flower	Infusion, decoction, raw	Oral, dermal	Bardales *et al*. 2020
			Conjunctivitis, pneumonia, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Diarrhea, colic	Llama and vicuna	Whole plant	Infusion	Oral	Quiso 2014
***Mauria simplicifolia* Kunth**	Gian	Anacardiaceae	Inflammation	Bovine	Leaves	Decoction	Dermal	Díaz 2023
***Medicago lupulina* L.**	Trebol, rébol, kimsa rapi	Fabaceae	Termination of pregnancy (abortion)	Bovine	Flower	Raw	Oral	Castañeda 2019
***Medicago sativa* L.**	Alfalfa	Fabaceae	Piroplasmosis, lactation	Bovine	Aerial part, leaves	Decoction, liquefied, infusion	Oral	Bardales *et al*. 2020
***Melissa officinalis* L.**	Toronjil	Lamiaceae	Anthrax, diarrhea, tympanism	Bovine	Aerial part, leaves.	Infusion	Oral	Bardales *et al*. 2020
***Mentha spicata* L.**	Hierba buena	Lamiaceae	Inflammation	Bovine	Stem, leaves	Decoction	Dermal	Díaz 2023
***Mentha × piperita* L.**	Menta	Lamiaceae	Pneumonia, diarrhea, empacho, tympanism	Bovine	Leaves, aerial part	Infusion, raw, liquefied, decoction	Oral	Bardales *et al*. 2020
***Minthostachys mollis* (Benth.) Griseb.**	Muña	Lamiaceae	Mastitis, diarrhea, worms infestations, empacho, ruminal atony, tympanism.	Bovine	Aerial part, whole plant, leaves.	Infusion, fermented, raw, decoction	Topical, oral	Bardales *et al*. 2020
			Internal parasites, fracture, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Minthostachys setosa* (Briq.) Epling**	Waycha, muña	Lamiaceae	Cold, diarrhea, allicuya	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Musa × paradisiaca* L.**	Plátano	Musaceae	Diarrhea	Bovine and pig	Fruit	Raw	N/A	Burga 2016

***Mutisia acuminata var. hirsuta* (Meyen) Cabrera**	Manka paki, chinchilkuma	Asteraceae	Fasciola hepatica	N/A	N/A	N/A	Oral	Castañeda 2019
***Myristica fragrans* Houtt.**	Nuez moscada	Myristicaceae	Altitude sickness	Llama and vicuna	Fruit	Raw	Topical	Quiso 2014
***Nasturtium officinale* W.T.Aiton (Reubicar)**	Berro, verso, versillo, oqoruru	Brassicaceae	Piroplasmosis, diarrhea, fasciola hepatica	Bovine	Leaves, shoot, aerial part	Infusion, raw, juice	Oral	Bardales *et al*. 2020
			Fever, pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Fever	Llama and vicuna	Whole plant	Juice	Oral	Quiso 2014
***Nicotiana rustica* L.**	Tabaco cimarrón	Solanaceae	Lice	Bovine	Leaves	Decoction	Dermal	Díaz 2023
***Nicotiana thyrsiflora* Goodsp.**	Thujsa thujsa	Solanaceae	Lice	Llama and vicuna	Whole plant	Infusion	Oral	Quiso 2014
***Ocimum basilicum* L.**	Albahaca	Lamiaceae	Inflammation	Dog	Leaves	Raw, infusion	N/A	Burga 2016
***Oenothera rosea* L'Hér. ex Aiton**	Yawar soqo, chupa sangre	Onagraceae	Blow	Bovine	Leaves	Ground	Topical	Castañeda 2019
***Ophryosporus peruvianus* (J.F.Gmel.) R.M.King & H.Rob.**		Asteraceae	Fracture	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Opuntia ficus indica* (L.) Mill.**	Tuna	Cactaceae	Indigestion	Bovine	Stem	Ground	Oral	Díaz 2023
***Otholobium glandulosum* (L.) J.W.Grimes**	Culén	Fabaceae	Diarrhea, stomatitis, Indigestion, tympanism	Bovine	Bark, leaves, aerial part	Infusion	Oral	Bardales *et al*. 2020
***Otholobium munyense* (J.F.Macbr.) J.W.Grimes**	Culen	Fabaceae	Indigestion	Bovine	Leaves	Decoction	Oral	Burga 2021
***Parastrephia quadrangularis* (Meyen) Cabrera**	T'ola	Asteraceae	Internal parasites, bronchitis, lice	Llama and vicuna	Whole plant	Decoction, ash	Oral, topical	Quiso 2014
***Passiflora mixta* L.f.**	Poro poro	Passifloraceae	Placental abruption	Bovine	Leaves	Ground	Oral	Burga 2021
***Peperomia galioides* Kunth**	Coche gordo chico, tullushacay	Piperaceae	Internal parasites	Bovine	Whole plant	Ground	Oral	Apaéstegui2023

***Perezia multiflora* (Bonpl.) Less.**	Chancorumi, chanqoruma	Asteraceae	Fever, pneumonia, stomach pain, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Fever	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Persea americana* Mill.**	Palta (pepa)	Lauraceae	Diarrhea	Llama and vicuna	Seed	Heated	Oral	Quiso 2014
***Petiveria alliacea* L.**	Mucura	Petiveriaceae	Indigestion bronchitis	Bovine, poultry, dog	Leaves	Raw	N/A	Burga 2016
***Phaseolus pachyrrhizoides* Harms**	Habilla	Fabaceae	Piroplasmosis, mastitis, worm infestation, tick infestation, scabies, rumen atony.	Bovine	Fruit, stem, flower, leaves	Decoction, heated, raw, juice, infusion liquified,	Oral, topical, dermal	Bardales *et al*. 2020
***Phoradendron nervosum* Oliv.**	Suelda, consuelda	Santalaceae	Horsefly bite, swelling of the jaw.	Bovine	Leaves	Liquified, decoction	Dermal	Bardales *et al*. 2020
***Phragmites australis* (Cav.) Trin. ex Steud.**	Carricillo, carrizo	Poaceae	Diarrhea	Bovine	Aerial part; leaves	Raw, infusion	Topical, dermal	Bardales *et al*. 2020
***Pimpinella anisum* L.**	Anís	Apiaceae	Diarrhea, cold	N/A	Seed	Infusion	Oral	Sánchez-Vega & Dillon 2006
***Piper acutifolium* Ruiz & Pav.**	Matico de huerta	Piperaceae	Diarrhea	Bovine	Leaves	Raw	Dermal	Bardales *et al*. 2020
***Piper aduncum* L.**	Cordoncillo, matico	Piperaceae	Worms, empacho, ruminal atony	Bovine	Aerial part, leaves	Infusion	Oral, Topical	Bardales *et al*. 2020
			Cold	Llama and vicuna	Leaves	Infusion	Oral	Quiso 2014
***Piper barbatum* Kunth**	Matico	Piperaceae	Inflammation	Bovine	Leaves	Decoction	Lavado	Díaz 2023
***Plantago lanceolata* L.**	Llantén menor	Plantaginaceae	Mastitis, worm infestation	Bovine	Aerial part	Infusion, raw	Oral, dermal, topical	Bardales *et al*. 2020
***Plantago major* L.**	Llantén	Plantaginaceae	Urinary tract infection, fever	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			N/A	Llama and vicuna	Leaves	Infusion	Oral	Quiso 2014

			Mastitis, worms infestation, wart, wound healing	Bovine	Leaves	Liquefied, raw	Dermal, topical	Bardales *et al*. 2020
***Plantago monticola* Decne.**	Jinchu jinchu	Plantaginaceae	Wound	N/A	Leaves	Raw	Topical	Sánchez-Vega & Dillon 2006
***Porophyllum ruderale* (Jacq.) Cass.**	Hierba del gallinazo	Malvaceae	Plague	Bovine	Aerial part, leaves	Infusion	Dermal, oral	Bardales *et al*. 2020
***Quinchamalium chilense* Molina**	Mali mali o quincha mali	Schoepfiaceae	Inflammation, prolapse	Llama and vicuna	Whole plant	Infusion	Oral	Quiso 2014
***Rhynchospora macrochaeta* Steud. ex Boeckeler**	Cortadera chica	Asteraceae	Tick disease	Bovine	Aerial part, root	Infusion	Oral	Bardales *et al*. 2020
***Ricinus communis* L.**	Higuerilla	Euphorbiaceae	Tick disease	Bovine	Fruit, leaves	Decoction, raw, infusion	Oral	Bardales *et al*. 2020
***Rosmarinus officinalis* L.**	Romero de castilla	Lamiaceae	Anthrax, piroplasmosis	Bovine	Leaves, aerial part	Infusion, fermented	Dermal, oral	Bardales *et al*. 2020
***Rumex obtusifolius* L.**	Malayerba, hierbamaria	Polygonaceae	Plague, lice	Bovine	Root	Raw, infusion, liquefied	Oral	Bardales *et al*. 2020
***Rumex peruanus* Rech.f.**	Canchil, undului, undulón	Polygonaceae	Stomatitis, fasciola hepatica, scabies	Bovine	Leaves	Juice, raw	Oral	Bardales *et al*. 2020
***Ruta chalepensis* L.**	Ruda	Rutaceae	carbuncle, indigestion, wart	Bovine	Leaves, aerial part, whole plant	Fermented, raw, decoction, liquefied	Topical, dermal, oral	Bardales *et al*. 2020
***Ruta graveolens* L.**	Ruda	Rutaceae	Air sickness	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Salpichroa micrantha* Benoist**	Ñuñu ñuñu	Solanaceae	Pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Salvia macrophylla* Benth.**	Salvia azul	Lamiaceae	Tick disease, horsefly bites	Bovine	Whole plant; aerial part	Raw, infusion	Topical, oral	Bardales *et al*. 2020
***Salvia officinalis* L.**	Salvia	Lamiaceae	Cold	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Salvia oppositiflora* Ruiz & pav.**	Quindeshiguna	Lamiaceae	Fly larvae	Bovine	Leaves	Juice	Topical	Díaz 2023

***Salvia rosmarinus* Spenn.**	Romero	Lamiaceae	Cold, umbilical hernia	Llama and vicuna	Leaves	Decoction	Topical, dermal	Quiso 2014
***Sambucus peruviana* Kunth**	Sauco	Adoxaceae	Ticks disease, scabies, plague, mastitis	Bovine	Aerial part, leaves, fruit	Infusion, decoction	Topical, dermal	Bardales *et al*. 2020
			Constipation	N/A	Bark	Ground	Oral	Burga 2021
***Sapindus saponaria* L.**	Choloque	Sapindaceae	Horsefly sting	Bovine	Fruit	Infusion	Topical, dermal	Bardales *et al*. 2020
***Schinus molle* L.**	Molle	Anacardiaceae	Mastitis, worm infestation	Bovine	Leaves	Infusion, liquefied	Topical, dermal	Bardales *et al*. 2020
			Prolapse	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Senecio clivicola* Wedd.**	Qariwa	Asteraceae	Fracture, blow	Llama and vicuna	Whole plant	Raw	Oral, topical	Quiso 2014
***Senecio nutans* Sch.Bip.**	Chachakoma	Asteraceae	Pneumonia, conjunctivitis, fever, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
			Cold, colic	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Senecio violifolius* Cabrera**	Huancolipa	Asteraceae	Pneumonia, internal parasites, fever, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Senna versicolor* (Meyen ex Vogel) H.S.Irwin & Barneby**	Motoy, kalamotoy, Kalamutuy, mutuy	Fabaceae	Lice	Bovine	Branch	Decoction	Dermal	Castañeda *et al*. 2017
			Lice	Bovine	Branch	Decoction	Dermal	Castañeda 2019
***Solanum asperolanatum* Ruiz & Pav.**	Cujaca	Solanaceae	External parasites, lice, mastitis	Bovine	Leaves	N/A	N/A	Burga 2021
***Solanum juzepczukii* Bukasov**	Papa luk'i, papa amarga	Solanaceae	Fever	Llama and vicuna	Tuber	Juice	Oral	Quiso 2014
***Solanum nitidum* Ruiz & Pav.**	Ñuchku, ñuñunka, ñuñunkay	Solanaceae	Lice	Bovine	Branch	Decoction	Dermal	Castañeda 2019
***Solanum tuberosum* L.**	Papa	Solanaceae	Fever, umbilical pyosepticemia	Llama and vicuna	Tuber	Dehydrated	Oral, dermal	Quiso 2014

***Sonchus oleraceus* L.**	Cerraja, qhanachu	Asteraceae	Pneumonia	Bovine	Aerial part	Juice	Oral	Bardales *et al*. 2020
			Fever	Llama and vicuna	Whole plant	Infusion	Oral	Quiso 2014
***Spartium junceum* L.**	Retama	Fabaceae	Constipation	Pig, dog	Flower	Raw		Burga 2016
Stachys arvensis	Subsacha	Lamiaceae	Diarrhea, mastitis, constipation	Bovine	Aerial part, leaves	Decoction, infusion	Oral, topical	Bardales *et al*. 2020
***Swartzia polyphylla* DC.**	Cumaceba	Fabaceae	Oestrus enhancement	Pig and dog	Bark	Fermented	Oral	Burga 2016
***Tagetes elliptica* Sm.**	Marisacha	Asteraceae	Mastitis	Bovine	Leaves	Fermented	Topical	Bardales *et al*. 2020
***Tagetes filifolia* Lag.**	K'ita anis	Asteraceae	Fever, pneumonia, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Tagetes mandonii* Sch.Bip. ex Klatt**	Chijchipa	Asteraceae	Diarrhea	N/A	Whole plant	Infusion	Oral	Sánchez-Vega & Dillon 2006
***Tanacetum parthenium* (L.) Sch.Bip.**	Callimanzanilla	Asteraceae	Mastitis, worms infestation	Bovine	Leaves, aerial part	Decoction, infusion, fermented, raw	Oral, topical, dermal	Bardales *et al*. 2020
***Tanacetum vulgare* L.**	Palma real	Asteraceae	Diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Tara spinosa* (Molina) Britton & Rose**	Taya	Fabaceae	Hull ulcer	N/A	Fruit	Ground	Topical	Perez 2021
***Taraxacum fernandezianum* Dahlst.**	Diente de león	Asteraceae	Fasciola hepatica	Bovine	Aerial part	N/A	Oral	Castañeda 2019
***Taraxacum officinale* (L.)**	Diente de león, amargón	Asteraceae	Diarrhea	Bovine	Aerial part, root	Infusion	Oral	Bardales *et al*. 2020
***Tephrosia sinapou* (Buc'hoz) A.Chev.**	Barbasco	Fabaceae	Horsefly sting	Bovine	Leaves, Root	Infusion, liquefied	Topical, dermal	Bardales *et al*. 2020
***Tessaria integrifolia* Ruiz & Pav.**	Pájaro bobo	Asteraceae	Stable fly	Bovine	Leaves	Infusion	Oral	Bardales *et al*. 2020
Tetraglochin alata* var. *alata	Kanlla	Rosaceae	External parasites, fever	Llama and vicuna	Whole plant	Ash	Topical	Quiso 2014

***Tetraglochin cristata* (Britton) Rothm.**	Canlli	Rosaceae	Fever	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Toxicodendron striatum* (Ruiz & Pav.) Kuntze**	Itil	Anacardiaceae	Lice	Bovine	Leaves	Infusion	Dermal	Bardales *et al*. 2020
***Trifolium amabile* Kunth**	Layo	Fabaceae	Pneumonia	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Trifolium repens* L.**	Trébol	Fabaceae	Diarrhea	Bovine	Leaves	Infusion	Oral	Bardales *et al*. 2020
***Tropaeolum tuberosum* Ruiz & Pav.**	Mashua, izaño, izaño silvestre, pajarillo	Tropaeolaceae	Diarrhea, stomatitis, wound healing	Bovine	Root	Infusion, decoction, liquefied	Oral, topical	Bardales *et al*. 2020
			Urine retention	Llama and vicuna	Tuber	Juice	Oral	Quiso 2014
***Ullucus tuberosus* Caldas**	Olluco	Basellaceae	Dilatation in labor	Bovine	Root	Decoction, fermented, raw	Topical, dermal	Bardales *et al*. 2020
***Uncaria guianensis* (Aubl.) J.F.Gmel.**	Uña de gato	Rubiaceae	Wound	Bovine	Bark	Infusion	N/A	Burga 2016
***Urtica urens* L.**	Ortiga, ortiga negra, ortiga macho	Urticaceae	Diarrhea, swelling of the jaw	Bovine	Root	Infusion, decoction	Oral	Bardales *et al*. 2020
			Urinary tract infection, fever, diarrhea	Alpaca	N/A	N/A	N/A	Gutierrez-Flores *et al*. 2023
			Fever	Llama and vicuna	Whole plant	Juice	Oral, dermal	Quiso 2014
***Verbena hispida* Ruiz & Pav.**	Verbena	Verbenaceae	Infection	Bovine	N/A	N/A	Oral	Castañeda 2019
***Verbena litoralis* Kunth**	Verbena, verbena negra	Verbenaceae	Fever	Bovine	Whole plant	Ground	Oral	Apaéstegui, 2023
			Plague	N/A	Stem, leaves, flower	Ground	Oral	Cieza 2023
			Wound, mycosis, diarrhea	Duck	Leaves	Raw, infusion	N/A	Burga 2016

			Peste, Fasciola hepatica	Bovine	Leaves	Decoction, infusion	Oral	Bardales *et al*. 2020
			Fever, infection	Llama and vicuna	Whole plant	Decoction	Oral	Quiso 2014
***Villadia dyvrandae* (Raym.-Hamet) Baehni & J.F.Macbr.**	Coche gordo macho	Crassulaceae	Parasites	Bovine	Whole plant	Crushing	Oral	Apaéstegui 2023
***Werneria poposa* Phil.**	Pupusa	Asteraceae	Internal parasites, fever, diarrhea	Alpaca	N/A	N/A	N/A	Gutiérrez-Flores *et al*. 2023
***Xanthium spinosum* L.**	Allqu kiska	Asteraceae	Fever	Livestock, alpaca	Leaves, stem	Infusion	Dermal, oral	Mathez-Stiefel *et al*. 2018
***Zea mays* L.**	Maíz	Poaceae	Mastitis, scabies, wart, lactation, dilatation at delivery	Livestock	Fruit, aerial part, leaves	Decoction, infusion, raw, liquefied	Oral, topical, dermal	Bardales *et al*. 2020
			Wart	Poultry	Fruit	Raw	N/A	Burga 2016

Legend:
N/A: not available

Table 3. Phytochemical components of medicinal plants used in ethnoveterinary medicine in Peru.

Species	Phytochemical components	References
Acaulimalva alismatifolia **(K. Schum. & Hieron.) Krapov.**	N/A	
Achyrocline alata **(Kunth) DC.**	Chlorogenic acid, isoquercetrin, quercetin, chalcone, polyketides.	Pereira *et al*. 2017
Agave americana **subsp. *americana***	Alcaloides, saponinas, taninos, polifenoles, flavonoides	Shegute & Wasihun, 2020
Ageratina glechonophylla **(Less.) R.M.King & H.Rob.**	Coumarins, flavonoids, steroids, alkaloids, tannins and amino acids.	King *et al*. 2011
Ageratina sternbergiana **(DC.) R.M.King & H.Rob.**	Phenols	Gonzales *et al*. 2021
Ageratum conyzoides **L.**	The oil contains precocene, caryophyllene, β-acoradiene and γ-amorphene.	do Rosário *et al*. 2023
	Oxygenated monoterpenes	Hema *et al*. 2023
Airampoa soehrensii **(Britton & Rose) Lodé**	Tannins, alkaloids, flavonoids and coumarins.	Merino & Perez 2019
Alchemilla pinnata **Ruiz & Pav.**	N/A	
Allium cepa **L.**	Flavonoids, glycosides, quercetin, allicin, anthocyanins and polyphenols.	El-Gindy *et al*. 2023
Allium sativum **L.**	Phenolic compounds, vitamins and trace elements (selenium and germanium).	Waqas *et al*. 2018
Alnus acuminata **Kunth**	Triterpenoids and diarylheptanoids.	Aguilar *et al*. 2011
Aloe vera **(L.) Burm.f.**	75 biologically active compounds (protein, fiber, lysine, calcium, phosphorus, methionine, and others).	Akhtar *et al*. 2012
Alternanthera mexicana **Moq.**	N/A	
Alternanthera porrigens **(Jacq.) Kuntze**	Phenolic compounds, flavonoids, B-carotene.	Madrid *et al*. 2013
Alternanthera pungens **Kunth**	Alkaloids, saponins, steroids, leucoanthocyanidin, triterpenoids, b-spinasterol, oleanolic acid, choline.	Calderón *et al*. 1997
Ambrosia arborescens **Mill.**	Sesquiterpenes and diterpenes.	De Leo *et al*. 2010
Ambrosia cumanensis **Kunth**	Sesquiterpene lactones.	Jimenez-Usuga *et al*. 2016
Annona cherimola **Mill.**	Flavonoids, phenolic acids, stilbenes, lignans and xanthones.	Perrone *et al*. 2022
Arracacia peruviana **(H.Wolff) Constance**	Monoterpene hydrocarbons, oxygenated monoterpenes, sesquiterpene hydrocarbons, oxygenated sesquiterpenes, aliphatic compounds, aromatic compounds	Quijano-Célis & *et al.* 2016
Artemisia absinthium **L.**	Polyphenols.	Tariq *et al*. 2009
Azorella compacta **Phil.**	Two diterpenoids (mulinolic acid and azorelanol)	San-Martín *et al*. 2018
Baccharis genistelloides **(Lam.) Pers.**	Terpenoids, diterpenoids, sesquiterpenes, triterpenoids, essential oils, flavonoids, coumarins.	Ruíz *et al*. 2008
Baccharis latifolia **Pers.**	The essential oil contains limonene felendrene sabinene - pinene, α-pinene.	Valarezo *et al*. 2013
Baccharis tricuneata **(L.f.) Pers.**	Its oil contains E)-nerolide, α-pinene, (E)-β-ocimene, myrcene, mainly.	Arze *et al*. 2004

***Banisteriopsis caapi* (Spruce ex Griseb.) C.V.Morton**	ß-carbolines: harmine, harmaline and tetrahydroharmine. Proanthocyanidins, epicatechin and procyanidin B2.	Santos *et al*. 2022
***Beta vulgaris* L.**	Phenolic acids, flavonoids and phenolic anamides.	Ninfali & Angelino 2013
***Bidens andicola* Kunth**	N/A	
***Bidens pilosa* L.**	Phenolic acids, flavonoids, fatty acids, coumarins and furanocoumarins	Idris *et al*. 2023
***Bixa orellana* L.**	Phenols, alkaloids and flavonoids	Muddapur *et al.* 2023
***Brassica rapa* L.**	Glucosinolates, organic acids, polyphenols, quercetin-derived flavonoids, kaempferol, isorhamnetin	Dejanovic *et al.* 2021
***Buddleja incana* Ruiz y Pav.**	Phenols, terpenes, flavonoids, tannins, steroids, saponins, alkaloids, coumarins, leucoanthocyanidins, triterpene.	Gutiérrez *et al*. 2020
***Campsiandra angustifolia* Spruce ex Benth.**	Triterpenes, steroids, amino acids, flavonoids, saponins, tannins, phenols.	Celis 2013
***Canna indica* L.**	Flavonoids, anthocyanins.	Srivastava & Vankar 2010
***Capsella bursa-pastoris* (L.) Medik.**	kaempferol-3-O-ruthinoside, quinic acid, arginine, palmitic acid, β-sitosterol.	Grosso *et al*. 2011
***Capsicum annuum* L.**	It has capsacinoids such as dihydrocapsaicin, capsaicin, nordihydrocapsaicin, homodihydrocapsaicin, homocapsaicin and nonivamide.	Doğan *et al*. 2018
***Capsicum pubescens* Ruiz & Pav.**	Capsaicinoids, flavonoid aglycones, polyphenols, tocopherols, ascorbic acid.	Meckelmann *et al*. 2015
***Carica papaya* L.**	Ascorbic acid, polyphenols, elements such as calcium, potassium, magnesium and sodium	Abouzed *et al.* 2019
***Ceroxylon peruvianum* Galeano, Sanín & K.Mejia**	N/A	
***Cervantesia tomentosa* Ruiz & Pav.**	N/A	
***Cestrum affine* Kunth**	N/A	
***Cestrum auriculatum* L'Hér.**	N/A	
***Cestrum tomentosum* L.f.**	Saponins, alkaloids, tannins, flavonoids.	Abouelnour *et al*. 2022
***Chenopodium pallidicaule* Aellen**	Phenolic acids, flavonoids and betalains.	Repo-Carrasco-Valencia *et al*. 2010
***Chersodoma jodopappa* (Sch.Bip.) Cabrera**	N/A	
***Chuquiraga weberbaueri* Tovar**	Flavonoids, saponins, ethyl caffeine, and chlorogenic acid.	Chavez 2022
***Cichorium intibus* L.**	N/A	
***Citrus limon* (L.) Osbeck**	The oil contains: Limonene, β-Pinene, γ-Terpinene.	Ebani *et al*. 2018
***Citrus x paradisi* Macfad**	Limonene	Garbin *et al.* 2023
***Columellia obovate* Ruiz & Pav.**	N/A	
***Commelina erecta* L.**	Thirteen phenolic compounds, the most abundant of which are apigenin, luteolin and quercetin derivatives.	Cavichi *et al.* 2023

***Costus erythrocoryne* K.Schum**	N/A	
***Couroupita guianensis* Aubl.**	α-amyrin, β-amyrin, β-sitosterol, nerol, triptantrin, indigo, indirubin, isatin, linoleic acid, carotenoids and sterols. Flowers contain eugenol, linalool and farnesol. The leaves contain triterpenoid esters of fatty acids such as β-amyrin palmitate.	Al-Dhabi *et al*. 2012
***Croton lechleri* Müll.Arg.**	Phenolic compounds (proanthocyanidins, catechin, epicatechin, gallocatechin and epigallocatechin).	Lopes *et al*. 2004
***Cumulopuntia boliviana* (Salm-Dyck) F.Ritter**	N/A	
***Cydonia oblonga* Mill.**	Phenols, steroids, flavonoids, terpenoids, tannins.	Ashraf *et al*. 2016
***Cynodon dactylon* (L.) Pers.**	Proteins, minerals, flavonoids, carotenoids, alkaloids, glycosides and triterpenoids.	Ashokkumar *et al*. 2013
***Dalea pazensis* Rusby**	N/A	
***Daucus carota* L.**	It has phenolic compounds, carotenoids, polyacetylenes and ascorbic acid.	Boadi *et al*. 2021
***Desmodium molliculum (*Kunth) DC.**	Tannins, triterpene steroids, flavonoids flavonols, flavones (vitexin) or isoflavones (genistein and 5-o-o-methylgenistein), steroidal saponins, phenolic compounds, alkaloids and carbohydrates.	Olascuaga *et al*. 2020
***Distichia muscoides* Nees & Meyen**	N/A	
***Dysphania ambrosioides* (L.) Mosyakin & Clemants**	Phenols, flavonoids and polyphenols	Zohra *et al*. 2019
***Echeveria eurychlamys* (Diels) A.Berger**	N/A	
***Ephedra americana* Humb. & Bonpl. ex Willd.**	N/A	
***Equisetum bogotense* Kunth**	Nicotine, palustrine, palustridiene, phenylhexane debilitriol, equisetumine, guaiacylglycerol-β-coniferyl ether, thymidine, blumenol A, corcinososide C, sammangaoside A.	Boeing *et al.* 2021
***Equisetum giganteum* L.**	Caffeic acid, flavonoids (kaempferol) and phenol styrylpyrones (quercetin-3- *O* -(caffeoyl)-glucoside and 3-hydroxyhispidin-3,4′-di- *O* -glucoside).	Francescato *et al*. 2013
***Erodium cicutarium* (L.) L'Hér**	Tannins and flavonoids.	Fecka & Cisowski 2005
***Erythrina edulis* Triana ex Micheli**	Antioxidant peptides.	Intiquilla *et al*. 2016
***Erythroxylum coca* Lam.**	Cocaine and other alkaloids; flavonoids.	Restrepo *et al*. 2019.
***Escallonia pendula* (Ruiz & Pav.) Pers.**	N/A	
***Eucalyptus globulus* Labill.**	The main compound of eucalyptus essential oil is the terpene 1,8-cineole (eucalyptol).	Pimenta *et al*. 2024
***Euphorbia laurifolia* Juss. ex Lam.**	N/A	
***Festuca chrysophylla* Phil.**	N/A	
***Ficus insipida* Willd.**	N/A	
***Gamochaeta americana* (Mill.) Wedd.**	Alkaloids, tannins, phenolic compounds, flavonoids, leucoanthocyanin.	Tamariz-Angeles *et al*. 2018
***Gentiana prostrata* Haenke**	N/A	
***Geranium sessiliflorum* Cav.**	N/A	

***Gnaphalium viravira* Molina**	The main components of the oil are limonene, α-copaene, β-caryophyllene, geranyl-α-terpinene and geranyl-p-cymene.	Zohra *et al*.2019
***Gossypium barbadense* L.**	Total glycosides, flavonoids	Ade-Ademilua & Okpoma 2018
***Grindelia boliviana* Rusby**	Thirty-six flavonoids and hydroxycinnamic acids	Ferreres *et al*. 2014
***Hedyosmum scabrum* (Ruiz & Pav.) Solms**	Sesquiterpenes, oxygenated monoterpenes, monoterpene hydrocarbons, pinocarvone, germacrene D-4-ol, 1,8-cineole, a -pinene, linalool and sabinene.	Herrera *et al.* 2018
***Hordeum vulgare* L.**	Phenols, flavonoids, triterpenoids, hexadecanoic acid, 9-12 octadecanoic acid, y-sitosterol, campesterol, methyl ester.	Farooqi *et al.* 2024
***Hura crepitans* L.**	Tannins, saponins, flavonoids, coumarins, glycosides and triterpenoids.	Velazquez-González *et al*. 2022
***Hypochaeris meyeniana* (Walp.) Benth. & Hook.f. ex Griseb.**	N/A	
***Jatropha curcas* L.**	Alkaloids, flavonoids, phenylquinone and acetic acid.	Olukunle *et al*. 2011
***Juglans neotropica* Diels**	Pyrane compounds, phenols, carbohydrates	Aranda-Ventura *et al.* 2017
***Laennecia artemisiifolia* (Meyen & Walp.) G.L.Nesom**	N/A	
Lathyrus oleraceus Lam.	N/A	
***Lepechinia meyenii* (Walp.) Epling**	P-coumaric acid, caffeic acid, rosmarinic acid.	Crespo *et al*. 2019
	Caffeic acid, hesperidin, rosmarinic acid, diosmin, methyl rosmarinate, diosmethine and butyl rosmarinate.	Zuo *et al*. 2021
***Leucheria daucifolia* (D.Don) Crisci**	Phenolic compounds, tannins and flavonoids.	Wong & Ventura 2022
***Linum usitatissimum* L.**	Fatty acids, protein, cellulose, ash, Ca, P, vitamin A, D3 and E, Mn, Zn, Fe, I, Cu, Se.	Salem *et al*. 2023
***Lupinus ananeanus* Ulbr.**	N/A	
***Lupinus brachypremnon* C.P.Sm.**	N/A	
***Lupinus chlorolepis* C.P.Sm.**	N/A	
***Lupinus mutabilis* Sweet**	Phenolic compounds, oligosaccharides, quinolizidine alkaloids, vitamins, minerals.	Carvajal-Larenas *et al*. 2016
***Malva arborea* (L.) Webb & Berthel.**	Alkaloids, catechin phenols, triterpenes, steroids, tannins, flavonoids, saponin, reducing sugars, oils and fats.	Collaguazo & Márquez 2022
***Mansoa alliacea* (Lam.) A.H.Gentry**	ρ-coumaric, ferulic and chlorogenic acids, luteolin and apigenin.	Hamann *et al*. 2019
***Maquira coriacea* (H.Karst.) C.C.Berg**	N/A	
***Marrubium vulgare* L.**	The oil contains: β-bisabolene, β-caryophyllene, (E)-β-farnesene, 1,8-cineole.	Hamdaoui *et al*. 2013
***Matricaria chamomilla* L.**	Bisabolol	Hajaji *et al*. 2017

***Mauria simplicifolia* Kunth**	N/A	
***Medicago lupulina* L.**	Flavonoids, saponins and phenols.	Kicel & Olszewska 2015
***Medicago sativa* L.**	Saponins and prosapogenins.	Maestrini *et al*. 2019
***Melissa officinalis* L.**	Volatile compounds (e.g., geranial, neral, citronellal and geraniol), triterpenes (e.g., ursolic acid and oleanolic acid), and phenolics.	Travel *et al*. 2021
	38 compounds, with menthol standing out	Sipahi *et al*. 2022
***Mentha spicata* L.**	Carvone	Sanei-Dehkordi *et al*. 2023
***Mentha × piperita* L.**	Menthol (32.6%), menthone (22.0%), menthyl acetate (10.0%) and isomentone (9.39%).	Štrbac *et al*. 2023
	Carvone and limonene.	Bortoluzzi *et al*. 2021
***Minthostachys mollis* (Benth.) Griseb.**	The essential oil contains thirteen components (trans-menthone, pulegone, cis-menthone, limonene, linalool and others.	Mora *et al*. 2009
***Minthostachys setosa* (Briq.) Epling**	The oil contains peperine, carvone, pinene, piperitenone, sabinene, myrcene.	Schmidt-Lebuhn 2008
***Musa x paradisiaca* L.**	Phenols, glycosides, flavonoids, alkaloids, tannins, terpenoids.	Rao *et al.* 2016
***Mutisia acuminata var. hirsuta* (Meyen) Cabrera**	Simple phenolics, hydroxycinnamic acids, flavanones, flavonols	Fernández-Galleguillos *et al.* 2023
***Myristica fragrans* Houtt.**	The oil contains sabinene (20.22%), followed by terpinen-4-ol (12.08%), safrole (10.32%), and the main component, safrole (10.32%), - pinene (9.7%).	Zachariah *et al*. 2008
***Nasturtium officinale* W.T.Aiton**	Alkaloids, flavonoids, saponins, terpenoids, proteins, essential and volatile oils, glycosides, tannins, folic acid, vitamins and elements.	Al-Snafi 2020
***Nicotiana rustica* L.**	Possibly some flavonoid components.	Bensalah *et al*. 2009
***Nicotiana thyrsiflora* Goodsp.**	N/A	
***Ocimum basilicum* L.**	The oil contains: estragole (60.98%) and linalool (41.2%).	Oliveira *et al*. 2024
***Oenothera rosea* L'Hér. ex Aiton**	Tannins, flavonoids, steroids, carbohydrates and lipids.	Márquez-Flores *et al*. 2018
***Ophryosporus peruvianus* (J.F.Gmel.) R.M.King & H.Rob.**	Eighty-nine components in the essential oil, e.g., oxygenated sesquiterpenes, oxygenated diterpenes, sesquiterpene hydrocarbons, monoterpenes.	Mattos *et al*. 2020
***Opuntia ficus indica* (L.) Mill.**	Alkaloids, tannins, flavonoids and saponins.	Féboli *et al*. 2016
***Otholobium glandulosum* (L.) J.W.Grimes**	Two phenols, bakuchiol (1) and 3-hydroxybakuchiol (2), and two isoflavone glycosides, daidzin (3) and genistin (4).	Suárez *et al*. 2017
***Otholobium munyense* (J.F.Macbr.) J.W.Grimes**	N/A	
***Parastrephia quadrangularis* (Meyen) Cabrera**	Flavonoids, polyphenols.	Cifuentes *et al.* 2019
***Passiflora mixta* L.f.**	Phenols and flavonoids.	de Almeida *et al*. 2021

Peperomia galioides **Kunth**	The oil has 84 components, the main compounds are safrole (42.3%) and epi-a-bisabolol (29.2%).	Robayo-Gama *et al*. 2010
Perezia multiflora **(Bonpl.) Less.**	Essential oils, steroids, tannins, saponins, alkaloids. The root contains: flavonoids, arginine, choline, phenolic compounds.	López & Cuyan 2020
Persea americana **Mill.**	Peptone, b-galactoside, glycosylated abscisic acid, alkaloids, cellulose, polygalacto urease, polyuronoids, cytochrome P-450 and volatile oils.	Yasir *et al*. 2010
Petiveria alliacea **L.**	Flavonoids, phenols.	Pacheco *et al*. 2013
Phaseolus pachyrrhizoides **Harms**	N/A	
Phoradendron nervosum **Oliv.**	N/A	
Phragmites australis **(Cav.) Trin. ex Steud.**	Protein (10.2%), fiber (26.8%), calcium, phosphorus, potassium, magnesium.	Wang *et al*. 2022
Pimpinella anisum **L.**	Trans-anethole oil (93.9%) especially in the seed, it also has palmitic and oleic acids, protein.	Shojaii & Abdollahi 2012
Piper acutifolium **Ruiz & Pav.**	Benzoic acid derivatives.	Flores *et al*. 2008
Piper aduncum **L.**	The main component of the essential oil of leaves and fruits was apiol (57.1% and 66.3%, respectively).	Wibawa *et al*. 2019
	Phenolic compounds, monoterpenes, sesquiterpenes and chromene were found in the essential oil of leaves, stems and fruits.	Taher *et al*. 2020
Piper barbatum **Kunth**	The oil contains phellandrene (43.16%), limonene (7.04%).	Noriega *et al*. 2020
Plantago lanceolata **L.**	Tannins, other secondary metabolites, minerals and proteins.	Reza *et al*. 2021
Plantago major **L.**	Abenzoic compound, flavonoids, phenolic compounds, triterpenes.	Lans *et al*. 2007
Plantago monticola **Decne.**	N/A	
Porophyllum ruderale **(Jacq.) Cass.**	Chersitin, inulin, rutin, chlorogenic, caffeic and hydrocinnamic acid.	Bruno *et al*. 2013
Quinchamalium chilense **Molina**	Mainly phenolic acids, flavonoid glycosides, anthocyanins and tannins.	Simirgiotis *et al*. 2012
Rhynchospora macrochaeta **Steud. ex Boeckeler**	Flavonoids, stilbenes, coumarins, quinones and sesquiterpenes.	Ngankeu Pagning *et al*. 2016
Ricinus communis **L.**	Quercetin, gallic acid, flavone and kaempferol.	Ghosh *et al*. 2013
	Ricinoleic acid.	Sampieri *et al*. 2013
	Alkaloids, flavonoids, terpenoids, phenols, tannins, steroids, saponins, anthraquinones and cardiac glycosides.	Kebede & Shibeshi 2022
Rosmarinus officinalis **L.**	1,8-cineole, α-pinene, (+)-β-pinene, (-)-β-pinene, camphor.	Zoral *et al*. 2017
Rumex obtusifolius **L.**	Oxalic acid, chrysophanic acid, chrysophanol, emodin and physcion, epicatechin.	Lans *et al*. 2007
Rumex peruanus **Rech.f.**	N/A	
Ruta chalepensis **L.**	The oil has 33 compounds. The main ones are 2-Nonanone, 2-Undecanone, 2-Heptyl acetate, 2Acetoxytridecane, 5,6-diethenyl-1-methylcyclohexene (3.31%), Davanone and 2Decanone.	Youssef *et al*. 2024

***Ruta graveolens* L.**	Flavonoids and saponins	Delgadillo-Ruiz *et al*. 2018
	The oil contains 2-decanone, 2-tridecanone, 2-octanone, nonanal, 2-nonanone, 2-undecanone, 6-diethenyl-1-methyl, cyclotetradecane, and 2-dodecanone.	Castro *et al*. 2011
***Salpichroa micrantha* Benoist**	Lactonic sesquiterpenes: four salpichrolides, one withanolide called salpichrolide V.	Basso *et al.* 2017
***Salvia macrophylla* Benth.**	Fifty-eight compounds were found in the essential oil: 18-cineole, β-caryophyllene, α- and β-pinene, and sclareol, among others.	Asadollahi *et al*. 2019
***Salvia officinalis* L.**	Alkaloids, saponins, coumarins, flavonoids, tannins, polyacetylenes, steroids, terpenes/terpenoids.	Ghorbani & Esmaeilizadeh 2017
***Salvia oppositiflora* Ruiz & pav.**	Flavonoids, phenols.	Serrano *et al*. 2020
***Salvia rosmarinus* Spenn.**	Carnosol/carnosic acid, ursolic acid, polyphenols, flavonoids and terpenes.	de Macedo *et al*. 2020
***Sambucus peruviana* Kunth**	Malic acid, citric acid, flavonols, phenolic compounds, anthocyanins and hydroxycinnamic acids.	Porras-Mija *et al*. 2020
***Sapindus saponaria* L.**	Pure triterpene acetylated saponins.	Tsuzuki *et al*. 2007
***Schinus molle* L.**	The oil contains sabinene, limonene and bicyclogermacrene.	Santos *et al*. 2009
***Senecio clivicola* Wedd.**	N/A	
***Senecio nutans* Sch.Bip.**	The oil contains e 52.39 % Sabinene, 4-carene, 7.11 % τ-terpinene, 6.74 % βmyrcene, 3.78 % 4-terpinenol, 3.67 % Pulegone.	Ochoa *et al*. 2012
***Senecio violifolius* Cabrera**	N/A	
***Senna versicolor* (Meyen ex Vogel) H.S.Irwin & Barneby**	Apigenin, Stigmasterol, and d-pinitol	Blanco *et al*. 2008
***Solanum asperolanatum* Ruiz & Pav.**	Phytol	Guartán 2021
***Solanum juzepczukii* Bukasov**	N/A	
***Solanum nitidum* Ruiz & Pav.**	N/A	
***Solanum tuberusum* L.**	Anthocyanins.	Zhao *et al*. 2011
***Sonchus oleraceus* L.**	Minerals, flavonoids, flavonols, proanthocyanidins, total phenols and low levels of saponins, phytate and alkaloids.	Jimoh *et al*. 2011
***Spartium junceum* L.**	Flavonoids, saponin	Bilia *et al*. 1993
	The essential oil of fresh flowers contains 24 main constituents, including kairomonals, tricosane, tetracosane and pentacosane.	Giorgi & Ferri 2004
Stachys arvensis	Forty-three polyphenols, flavonoids, phenylethanoids, coumarins, chromones, panasenoside, gallotannins, chalcones, with hyperoside, sayaendoside and myricitrin, mainly.	Laggoune *et al*. 2023
***Swartzia polyphylla* DC.**	Isoflavones	Gómez 2011
***Tagetes elliptica* Sm.**	Twenty-seven compounds were identified in the essential oil, and the main ones were cis-tagetenone, dihydrotagetone, trans-tagetenone and trans-tagetone.	Cerrón-Mercado *et al*. 2023
***Tagetes filifolia* Lag.**	The oil contains 4-allylanisole, trans-anethole (4-propenylanisole), anethole, allylanisole.	Serrato-Cruz *et al*. 2008

***Tagetes mandonii* Sch.Bip. ex Klatt**	N/A	
***Tanacetum parthenium* (L.) Sch.Bip.**	The oil contains camphor, trans-β-farnesene, camphene, β-caryophyllene, and chrysanthenone, respectively.	Shafaghat *et al*. 2017
***Tanacetum vulgare* L.**	Saponins, polyphenols (tannins), alkaloids, non-protein amino acids, glycoside and lignin.	Kļaviņa *et al*. 2023
***Tara spinosa* (Molina) Britton & Rose**	Homoisoflavanes, coumarin, phenolic compounds.	Murthy 2022
***Taraxacum fernandezianum* Dahlst.**	N/A	
***Taraxacum officinale* (L.)**	Saponins, flavonoids, alkaloids and phenols	Mir *et al.* 2013
***Tephrosia sinapou* (Buc'hoz) A.Chev.**	Flavonoids	Martinez *et al*. 2011
***Tessaria integrifolia* Ruiz & Pav.**	Phenolic compounds, flavonoids, lignans, caffeoyl acid.	Ono *et al*. 2000
Tetraglochin alata* var. *alata	N/A	
***Tetraglochin cristata* (Britton) Rothm.**	N/A	
***Toxicodendron striatum* (Ruiz & Pav.) Kuntze**	N/A	
***Trifolium amabile* Kunth**	N/A	
***Trifolium repens* L.**	Flavonoids, flavonols, isoflavonoids, cyanogenic glycosides, saponins.	Ahmad & Zeb 2021
***Tropaeolum tuberosum* Ruiz & Pav.**	Carotenoids, phenolic compounds, glucosinolates, proanthocyanidins, anthocyanins, triterpenes, flavonols and flavones.	Silva-Correa *et al*. 2022
***Ullucus tuberosus* Caldas**	Thirty-two betalains, among which arginine-betaxanthin, histidine-betaxanthin and glutamine-betaxanthin stand out.	Svenson *et al*. 2008
***Uncaria guianensis* (Aubl.) J.F.Gmel.**	Seven alkaloids: rhinophylline, corynoxein, mitraphylline, isorhinophylline, isomitraphylline, isocorynoxein and dihydrocorynanthein.	Laus & Keplinger 2003
***Urtica urens* L.**	Polyphenols (mainly caffeic acid, p-coumaric acid, sinapic acid, ferulic acid, flavonoids).	Teixeira *et al*. 2023
***Verbena hispida* Ruiz & Pav.**	N/A	
***Verbena litoralis* Kunth**	Iridoids, phenylethanoids.	Vestena *et al*. 2019
***Villadia dyvrandae* (Raym-Hamet) Baehni & J.F.Macbr.**	N/A	
***Werneria poposa* Phil.**	Chromenes, benzofurans, acetophenones, coumarate diterpenes and pyrrolizidine alkaloids.	Lock & Rojas 2019
***Xanthium spinosum* L.**	Flavonoids, phenols, tannins, glycosides, phytosterols, glycosides, saponins and coumarins.	Barkatullah & Nafees 2022
***Zea mays* L.**	Flavonoids	Wang *et al*. 2010

Legend:

N/A: not available

Discussion

In ethnoveterinary medicine, the identification of diseases is based on the observation of certain symptoms present in animals, which healers know how to identify. For example, diarrhea in an animal is manifested by the foul odor of excreta or by the presence of bloody traces, which, according to veterinarians, can be caused by *Escherichia coli* or *Clostridium* sp. Fever is shown in the animal through signs of fatigue and rapid breathing. Worms is caused by the invasion of flies into the open wounds of animals, where they lay their eggs, preventing healing and aggravating the wounds, which can worsen with bacterial infection. Pneumonia presents symptoms similar to fever, such as fatigue and rapid breathing. Mastitis manifests as inflammation in the udder, accompanied by redness and a decrease in milk production (Bardales *et al.* 2020, Quiso 2014).
The leaves, stems, fruits, seeds and roots of certain plants are noted for their content of secondary metabolites, such as polyphenols, known for their antioxidant, anti-inflammatory, antitumor, wound healing and platelet anticoagulant effects, are the subject of frequent *in vivo* and *in vitro* studies to investigate their impact on the pathogenesis of endocrine disorders, neurodegenerative and cardiovascular diseases (Szypuła *et al*. 2024)

The action of phytochemicals reported in plants explains their use in ethnoveterinary medicine since ancient times. Thus, polyphenols in general are important in the health of animals and humans for their proven effects as antioxidants, anti-inflammatory, anticancer, immune system modulators, cardioprotective and neuroprotective (Valencia-Avilés, 2017). Although the main components of essential oils are terpenoids, which are emphasized in the reviewed articles, in reality, essential oils are complex mixtures of chemical compounds that include phenylpropanoids, alcohols, esters, aldehydes, ketones, acid lactones and sulfur compounds, among others, all of which contribute to their diverse aromatic and therapeutic character (Turek & Stintzing, 2013; Matulevich Pelaez et al. 2017).

Reviews also highlight that terpenoids possess anti-inflammatory, antitumor, antibacterial, antimalarial and antiviral actions, and facilitate transdermal absorption. In addition, they contribute to the prevention and treatment of cardiovascular diseases, insect resistance, immunoregulation, antioxidant action, anti-aging and neuroprotection (Yang *et al*. 2020). Other important compounds include saponins, with anti-inflammatory, anticancer, antimicrobial, antiviral, antioxidant and immunomodulatory actions (Juang & Liang, 2020), and anthraquinones, known for their antioxidant, anticancer, anti-inflammatory, laxative, antifungal and antibacterial properties (Duval *et al*. 2016).

Phytosterols have immunomodulatory, anti-inflammatory, antitumor, antibacterial and antifungal actions; but above all, hypocholesterolemic action or inhibition of cholesterol absorption, which leads to improved cardiovascular health in humans (Dudekula *et al.* 2022). In addition, peptides with antifungal, antibacterial and antiviral properties were identified (Lazzaro *et al.* 2020). Finally, vitamins, oligosaccharides, free amino acids and a remarkable richness in macro- and microelements were found in some plants, underlining their importance in health and nutrition.

Most bacteria and parasites that cause diseases in animals and produce economic losses, have developed resistance to drugs and create the need for the search for new sources of drugs based mainly on plants, with good prospects, if based on traditional knowledge, with the advantage of lower negative impacts on the environment (Abo-EL-Sooud, 2018). Thus, for example, various evidence indicates that there are no differences between certain plants used as dewormers in animals (*Artemisia absintihium*, *Allium sativum* and *Duranta erecta*) and the deworming drugs on the market (albendazole, ivermectin, fenbendazole, and doramectin), which creates the need for more in-depth studies to improve the quality of the evidence and the safety of their efficacy in each livestock species (Calzetta *et al*. 2020).

Fasciola hepatica, known as *alicuya*, is the causative agent of fasciolosis, a disease prevalent in the livestock valleys of Peru that causes digestive and nutritional disorders in cattle, sheep, goats, horses, canines and humans. Conventional veterinary treatment is based on the use of chemicals, the widespread use of which has led to the development of resistance, underscoring the need for new therapeutic alternatives. The traditional knowledge compiled in this study reveals that fasciolosis is one of the most relevant internal parasitosis, with up to 15 plants mentioned in its treatment (Table 2) (Chávez 2022; Ortíz *et al*. 2023).

Mastitis, a bacterial disease of high incidence, is responsible for considerable economic losses. This pathology, of multifactorial cause, is mainly attributed to staphylococci, streptococci and coliforms (*Escherichia, Klebsiella, Enterobacter)*. Conventional antibiotic treatment has led to the development of bacterial resistance, in addition to having implications for consumer health (Tomanic *et al*. 2022). In this study, mastitis is reported as the fifth most relevant condition according to traditional knowledge, with 19 plant species identified for treatment. In addition, at least 22 plants have been identified in

this study whose antibacterial properties have been demonstrated in *in vivo* or *in vitro* studies (Table 2), so further research is recommended to strengthen the scientific evidence.

Twenty-six percent of the plant species used in ethnoveterinary medicine in Peru lack phytochemical studies, which represents an important gap in scientific knowledge (Table 3). These plants, mostly of wild origin, have been used since ancient times by local communities to treat various diseases in animals, with effective and proven results over generations. The lack of research on their chemical composition and active principles limits the safe and effective use of these natural resources, which underlines the need for future scientific research to explore their potential benefits and possible applications, contributing to the preservation of traditional knowledge and the development of more integrated and sustainable veterinary practices.

Conclusions

Studies on ethnoveterinary medicine in Peru are limited and have documented the use of 181 plant species belonging to 61 botanical families, mostly native to the country. These studies have focused mainly on recording plants used to treat ailments in bovine, llama (*Lama glama*), vicuna (*Vicugna vicugna*) and alpacas (*Vicugna pacos*). However, there are fewer records and mentions of its use in sheep, horses, pigs, canines and poultry. The most common conditions treated in Peruvian ethnoveterinary medicine include diarrhea, fever, worms, pneumonia and mastitis. The most frequently used parts of the plant are the leaves, the aerial part (leaves + stem + flowers), the whole plant, the fruits and the roots. The most common preparations include infusions, decoctions, fresh use, juices and liquefied, administered mainly orally and topically, as well as through baths, poultices and soaks. The research highlighted the rich diversity of plants used in ethnoveterinary medicine in Peru. It also underlines the importance of expanding research to other species and preserving traditional knowledge to develop alternatives in modern veterinary medicine.

Approximately 74 % of the plants used in ethnoveterinary medicine in Peru have been the subject of at least one study on phytochemical compounds. However, the other 26 % have not been studied in terms of their phytochemical composition, which represents a significant opportunity for future research to fill these knowledge gaps. Among the most common phytochemicals found in the plants studied are polyphenols, essential oils, whose composition includes terpenoids. Phytosterols, alkaloids, glycosides, quinones and peptides were also found. The identification of these phytochemicals in the plants studied reinforces their possible medicinal value, which could have implications for the development of new veterinary treatments.

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: WSC, AJMG, GISO, JFSC conceptualized the work. WSC, AJMG, JFSC, collected, analyzed the data and prepared the draft manuscript. WSC, AJMG, GISO, JFSC, reviewed and edited the manuscript. WSC reviewed, proofread the final edit of the manuscript. All authors approved the final version of the manuscript.

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