Veterinary herbal medicines in India

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ABSTRACT

India has a rich and diversified flora. It is seen that synthetic drugs could pose serious problems, are toxic and costly. In contrast to this, herbal medicines are relatively nontoxic, cheaper and are eco-friendly. Moreover, the people have used them for generations. They have also been used in day-to-day problems of healthcare in animals. 25% of the drugs prescribed worldwide come from plants. Almost 75% of the medicinal plants grow naturally in different states of India. These plants are known to cure many ailments in animals like poisoning, cough, constipation, foot and mouth disease, dermatitis, cataract, burning, pneumonia, bone fractures, snake bites, abdominal pains, skin diseases etc. There is scarce review of such information (veterinary herbs) in the literature. The electronic and manual search was made using various key words such as veterinary herbal, ethno-veterinary medicines etc. and the content systematically arranged. This article deals with the comprehensive review of 45 medicinal plant species that are official in Indian Pharmacopoeia (IP) 2014. The botanical names, family, habitat, plant part used and pharmacological actions, status in British Pharmacopoeia 2014, USP 36 are mentioned. Also, a relationship between animal and human dose, standardization and regulatory aspects of these selected veterinary herbs are provided.

Key words: Indian Pharmacopoeia 2014, standardization, veterinary herbs

INTRODUCTION

Herbal medicines are being used by an increasing number of people as these products are considered to have no side effects or minimum side effects. In Asian and African countries, 80% of the population depends on traditional medicine for their primary health-care needs. Herbal medicines are the most lucrative form of traditional medicines, generating billions of dollars in revenue. Researchers look to traditional medicines as a guide to help, as 40% of the plants comprise key ingredients that can be used for prescription drugs. It is reported that in 2011-2012, the herbal global market was worth $80 billion. India’s herbal industry is worth around Rs 16,000 crores or US$ 4,000 million.

Veterinary herbal medicines comprise plant-based medicines and their therapeutic, prophylactic, or diagnostic application in animal health care. The application of herbal medicines in human health care and animal health care has a long history that can be traced back over millennia. In the rural areas of India, the veterinary medicines cover knowledge, skills, methods, practices, and beliefs of the smallholders about caring for their livestock. These smallholders are unable to spend on quality health of
their livestock, mainly due to non-affordability, whereas high-end health care is mainly met by expensive yet effective synthetic drugs. The side effects of the synthetic drugs such as presence of antibiotic residues leads to antibiotic resistance in humans; the toxic metabolites remain in meat, and the byproducts of synthetic drugs become a matter of concern in the long-term usage of such drugs. Issues like these have prompted the search for the use of alternatives such as herbal preparations, as these are cheap and safe as compared to modern animal health-care systems.\textsuperscript{[64]}

Indian Pharmacopoeia (IP) is an official regulatory document meant for overall quality control and assurance of pharmaceutical products marketed in India and thus, contributing to the safety, efficacy, and affordability of medicines. IP is published by the Indian Pharmacopoeia Commission on fulfillment of the requirements of the Drugs and Cosmetics Act 1940 and Rules 1945 under it. It contains a number of carefully chosen herbal monographs, extracts, and formulations. Each monograph of a herb in the IP specifies the botanical name according to the binomial system of nomenclature, specifying the genus, species, variety, and the quality specifications.\textsuperscript{[7]}

Medicinal herbs contain a vast range of pharmacologically active ingredients and each herb has its own unique combination and properties. Many herbs (whole plants) contain ingredients which have several effects that are combined in the one medicine. It would be appropriate to weigh the risk-benefit ratio based on the scientific evidence and experience of a prescriber while prescribing such herbal medicines in the interest of animal health.

\textbf{Relationship between animal dose and human dose}

The appropriate translation of drug dosage from one animal species to another and the translation of animal dose to human dose are both very important from the point of safety and efficacy of drugs. Moreover, forced administration and mixing of drug with fodder are usually done to administer the drugs to animals. The Food and Drug Administration\textsuperscript{[45]} has suggested that the extrapolation of animal dose to human dose is correctly performed through normalization to body surface area (BSA), which often is represented in mg/m\textsuperscript{2}. The human dose equivalent can be more appropriately calculated by using the formula shown in Table 1.

\textbf{Preparation of veterinary herbal medicines}

Herbal medicines for veterinary use can be given or prepared in a number of ways:

- Fresh herbs are chopped and mixed with food. It is perhaps the ideal way to give herbs when they are available.
- Dried herbs can be administered by their addition to food or making them into infusions or decoctions by adding hot water for internal or external use.
- Alcoholic tinctures are given directly or diluted in water, and given orally carefully using a syringe or dropper.
- Oil infusions or lotions are given externally, for example, by rubbing on sore joints.
- Commercially prepared tablets or powders are the most commonly seen form of herbal remedy.

\textbf{Herbal drugs used in veterinary practice}

Medicinal plants for various animal diseases in different parts of India are compiled in IP 2014. Also, the official statuses of the herbs in the British Pharmacopoeia (BP) 2014 and the United States Pharmacopoeia (USP) 36 are summarized in Table 2.\textsuperscript{[7,9-44]}

\textbf{Standardization and regulatory aspects of veterinary herbal medicines}

Standardization of veterinary herbal medicines (crude drugs/extracts) is necessary to establish their quality, consistency, and reproducibility to ensure that one or more of the veterinary herbal medicine’s key phytochemical ingredients or other ingredients are present in a defined amount. It is also necessary to implement quality control for batch-wise consistency, uniformity of dosage, stability, and for the detection of contamination/adulteration.\textsuperscript{[45]}

The identification of biologically active compounds in herbs is essential for quality control and also for determining the dose of the plant-based drugs. Also, knowledge of the appropriate dosage of these plant-based drugs is needed, as certain plants when used in small quantities are useful as veterinary medicines, whereas in large quantities are poisonous, e.g., \textit{Abrus precatorius}.

Standardization of herbal medicines is a difficult process because these medicines contain complex mixtures of different compounds. Thus, the herbs responsible for the medicinal effect are often unknown. Knowledge of the physicochemical properties of herbal medicines, along with other preformulation data, is necessary for the standardization and validation of active constituents. Various chemical, spectroscopic, and biological methods are also employed for the standardization. Some examples include infrared spectroscopy, liquid chromatography, high performance thin layer chromatography (HPTLC), nuclear magnetic resonance, mass spectroscopy, etc.\textsuperscript{[40] [Figure 1]}

Good manufacturing practices (GMP) is a system that ensures that the products manufactured are consistently produced, are controlled according to quality standards, and that they minimize those risks involved in production that cannot be eliminated through testing of the final product. GMP covers all aspects of the manufacturing process.

\begin{table}
\centering
\caption{Conversion of human equivalent dose to animal dose}
\begin{tabular}{llll}
\hline
Species & Weight (kg) & BSA (mg/m\textsuperscript{2}) & \textit{K}_\text{c} factor \\
\hline
Human & & & \\
Adult & 60 & 1.6 & 37 \\
Child & 20 & 0.8 & 25 \\
Baboon & 12 & 0.6 & 20 \\
Dog & 10 & 0.5 & 20 \\
Monkey & 0.8 & 0.24 & 12 \\
Rabbit & 1.8 & 0.15 & 12 \\
Guinea Pig & 0.4 & 0.05 & 8 \\
Rat & 0.15 & 0.025 & 6 \\
Hamster & 0.008 & 0.02 & 5 \\
Mouse & 0.02 & 0.007 & 3 \\
\hline
\end{tabular}
\end{table}
### Table 2: Crude and processed herbs in IP 2014

| Botanical name/ local name of the plant | Family | Habitat | Parts of plant used | Reported indications | Authors | References | Pharmacopoeial status |
|----------------------------------------|--------|---------|---------------------|---------------------|---------|------------|----------------------|
| *Acacia nilotica* (Indian gum)         | Leguminosae, Mimosaceae | Throughout the drier parts of India | Seeds and bark Leaf | Acidity, foot disease Cough and cold, tissue healing | Takhar, Pande et al. Pandit, Jaiswal et al. | 11, 12 | - - |
| *Adhatoda vasica* (Vasaka)            | Acanthaceae | Throughout India, up to an altitude of 1,300 m | Leaf | Snake bite Cold, cough, fever, swollen throat, hemorrhagic septicemia, arthritis, foot and mouth disease, skin infection, itching, pruritis, snakebite | Phondani et al. Pandi, Jaiswal et al. | 4 | √ √ |
| *Allium sativum* (Garlic)              | Liliaceae | Native to Central Asia cultivated all over India | Leaf Bulb | | Pande et al.; Pandit, Galav et al., Sadangi et al., Mulay et al. | 12, 13, 15, 16, 17, |
| *Andrographis paniculata* (Kalmegh)   | Acanthaceae | Northeast India | Whole plant Root Leaf | Dysentery, fever Insect bite In babesiosis Milching disorder, diarrhoea, dysentery, indigestion, haemachuria | Pandit, Chakraborty and Pal Kumar | 13, 18 | - √ |
| *Asparagus racemosus* (Shatavari)      | Liliaceae | Found wild in tropical and subtropical parts of India, including the andaman’s and ascending in the Himalayas to 1,500 m | Root Leaf | | Pande et al., Galav et al., Mulay et al., Kumar, Pal and Jain, Bharati and Sharma, Ashok and Reddy, Kiruba et al. | 12, 16, 17, 20, 21, 22, 23 |
| *Azadirachta indica* (Neem)           | Meliaceae | Native to Burma; found all over India | Leaf | In swellings and inflammation constipation, dyspepsia, ulcer, prolapsed uterus, as mosquito repellent, Indigestion, liver disorders, tissue healing, small pox | Phondani et al., Pandit, Varshney, Takhar, Pande et al., Jaiswal et al., Galav et al., Sadangi et al., Mulay et al., Chakraborty and Pal, Pal and Jain, Varshney, Borthakur and Sharma | 4, 11, 12, 13, 14, 15, 16, 17, 18, 20, 24, 26 |
| *Bacopa monnieri* (Brahmi)            | Scrophulariaceae | Throughout the plains of India in damp marshy areas | Whole plant Seed | Parasitic skin diseases In paralytic attack | Galav et al | 15 | √ √ |
| *Berberis aristata* (Daaruharidra)    | Berbridaeae | Northwestern Himalayas, Nigiris, Kulu and Kumaon | Root, stems | Cataract, wounds, food poisoning | Phondani et al., Pande et al | 4, 12 | √ - |
| *Boerhavia diffusa* (Punarnava)       | Nyctaginaceae | Throughout India as a weed | Leaves Root Latex | Improve vitality Jaundice Eczema | Ashok and Reddy Singh et al | 22, 27 | - - |
| *Carica papaya* (Papain)              | Caricaceae | Cultivated in Uttar Pradesh, Punjab, Rajasthan, Gujarat, Maharashtra and South India | Latex | | Galav et al | 15 | - - |

*Contd...*
| Botanical name/ local name of the plant | Family | Habitat | Parts of plant used | Reported indications | Authors | References | Pharmacopoeial status |
|----------------------------------------|--------|---------|---------------------|----------------------|---------|------------|----------------------|
| Cassia angustifolia (Indian senna)      | Caesalpinaceae | Cultivated mainly in Tirunelveli and Ramnathpuram districts and to a lesser extent in Madurai, Salem and Tiruchirapalli districts of Tamil Nadu. Also grown on a small scale in Cuddapah district of Andhra Pradesh and certain parts of Karnataka | Pods and leaf | Acidity | Takhar | 11 | √ - |
| Cassia fistula (Amaltas)                | Caesalpinaceae | Cultivated as an ornamental throughout India | Leaf | Tongue sore, Purgative, constipation, to reduce swelling due to cold | Phondani et al, Pandit, Galav et al, Sadangi et al, Dey and De | 4, 13, 15, 16, 25 | - |
| Centella asiatica (Mandukaparni)       | Apiaceae | Marshy places throughout India up to 200 m | Seed | Emetic | Singh et al | 27 | - |
| Claviceps purpurea (Ergot)              | Clavicipitaceae | A fungous parasite on a number of grasses particularly in rye, cultivated in the Nilgiris and at Chakrohi farm in Jammu | Leaf | Uterine stimulant, oxytocic, abortifacient | Sharma and Singh | 28 | - |
| Coleus forskohlii                      | Lamiaceae | The sub-tropical Himalayas of Kumaon and Nepal; cultivated in Andhra Pradesh | Root and leaf | Spasmolytic, antithrombotic, anti-inflammatory | Sudarsanan et al | 29 | - √ |
| Coriandrum sativum (Coriander)         | Apiaceae, Umbelliferae | Cultivated chiefly in Madhya Pradesh, Maharashrta, Rajasthan, Andhra Pradesh, Tamil Nadu, Karnataka and Bihar | Seed oil | Constipation, haematuria, indigestion, poisoning, chicken pox, fever, dehydration | Phondani et al, Pande et al, Pandit | 4, 12, 13 | √ - |
| Curcuma domestica (Haridra)            | Zingiberaceae | Cultivated all over India, particularly in West Bengal, Tamil Nadu and Maharashtra | Rhizome | Constipation, food poisoning, indigestion, neck sore, skin disease, bone fracture, ulcer dysentery, dislocation of bone, mastitis, expectorant, yoke galls, tissue healing | Phondani et al, Pandit, Jaiswal et al, Varshney, Mishra et al, Kumar and Kumar, Bhattachari, Chintu et al | 4, 13, 14, 24, 30, 31, 32, 33 | √ √ |
| Cyamopsis tetragonoloba (Guar gum)     | Fabaceae | Cultivated throughout India, particularly in Haryana, Punjab, Rajasthan, Uttar Pradesh and Orissa | Endosperm | Laxative | Pande et al | 12 | - |

Contd...
| Botanical name/ local name of the plant | Family | Habitat | Parts of plant used | Reported indications | Authors | References | Pharmacopoeial status |
|----------------------------------------|--------|---------|---------------------|----------------------|---------|------------|----------------------|
| **Eclipta alba** *(Bhringraj)* | Asteraceae | Throughout India, up to 2,000 m on the hills | Leaf | Wound, antiseptic, swelling | Pandit, Mulay et al, Dey and De, Singh et al | 13, 17, 25, 27 | - | - |
| **Embelia ribes** *(Vidanga)* | Myrsinaceae | Throughout India | Seed | Diuretic, astringent, anti-inflammatory, antibacterial | Pandit | 13 | - | - |
| **Foeniculum vulgare** *(Saunf)* | Apiaceae | Native to the Mediterranean region; now cultivated mainly in Punjab, Assam, Maharashtra and Vadodra | Seed | Diarrhoea | Pandit, Borthakur et al | 13, 34 | √ | - |
| **Gymnema sylvestre** *(Gudmar)* | Asclepiadaceae | Central and Peninsular India | Leaf | Eye discharge, anti-diabetic | Pandit, Wynn | 13, 35 | - | √ |
| **Hemidesmus indicus** *(Anantmula)* | Asclepiadaceae | The Himalayas, from Kashmir to Nepal and Meghalaya, ascending to 1,800 m | Leaf | Convulsive seizure | Pandit | 13 | - | - |
| **Mangifera indica** *(Amra)* | Anacardiaceae | Found in Uttar pradesh, Punjab, Maharashtra, Andhra Pradesh, West Bengal and Tamil Nadu | Bark | Diarrhoea, eye disease, during food poisoning | Galav et al, Pande et al | 12, 15 | - | - |
| **Mentha arvensis** *(Mint)* | Lamiaceae | Cultivated in Jammu and Kashmir | Leaf | Fever, dysentery | Pandit, Phondani et al | 4, 13 | - | - |
| **Mucuna pruriens** *(Kaunch)* | Fabaceae | Throughout India, including Andaman and Nicobar Islands | Leaf | Diarrhoea, Ouster induction, wounds, cholera | Pandit, Galav et al., Kumar, Singh et al. | 13, 15, 19, 27 | - | - |
| **Ocimum sanctum** *(Tulasi)* | Lamiaceae | Throughout India; grown in houses, gardens and temples | Leaf | Cough and cold, rhinitis, body ache, purulent disease | Pandit, Sudarsanam et al | 13, 29 | - | - |
| **Picrorhiza kurroa** *(Kutki)* | Scrophulariaceae | The Alpine Himalayas from Kashmir to Sikkim | Roots | Digestive troubles, dysentery, alimentary disorders, intestinal worm, tonsil, diarrhoea | Pande et al, Sharma et al | 12, 36 | - | - |
| **Phyllanthus amarus** *(Bhuiamla)* | Euphorbiaceae | Throughout the hotter parts of India, particularly on cultivated land, up to 1,000 m. Native to tropical Southeast Asia; distributed throughout India, also planted in public parks | Whole plant | In malaria | Singh et al | 27 | - | √ |
| **Phyllanthus emblica** *(Amalaki)* | Euphorbiaceae | Fruit | Chicken pox, intestinal parasites, dyspepsia, diarrhoea, eye disease | Pande et al, Sharma et al | 12, 36 | √ | - |

Contd...
### Table 2: Contd...

| Botanical name/local name of the plant | Family | Habitat | Parts of plant used | Reported indications | Authors | References | Pharmacopoeial status |
|--------------------------------------|--------|---------|---------------------|----------------------|---------|------------|-----------------------|
| *Piper nigrum* (Maricha)              | Piperaceae | Native of the Indo-Malaysian region; cultivated in Western Ghats, Karnataka, Maharashtra, Assam and Kerala | Seed, Flower, fruit | Mastitis, cough, cold, fever, indigestion, throat swelling, intestinal disorder, blood in excreta, food poisoning, Diarrhoea | Pandit, Phondani et al, Mishra et al, Sharma et al, Choodnal | 4, 13, 30, 36, 37 | - √ |
| *Psoralea coryfolia* (Bakuchi)       | Fabaceae | Found in many parts of India | Seeds | In leukoderma, antibacterial, antihelmintic | Wynn, Rajan and Sethuraman | 35, 39 | - - |
| *Ricinus communis* (Castor seed)     | Euphorbiaceae | Cultivated chiefly in Andhra Pradesh, Maharashtra, Karnataka and Orissa | Seed oil | Acidity, throat problem, constipation, intestinal worms | Takhar, Galav et al, Mulay et al | 11, 15, 17 | - - |
| *Rubia cordifolia* (Manjistha)       | Rubiaceae | Throughout India, ascending to an altitude of 3,700 m | Stem | Astringent, diuretic, antidyserentric, antiseptic | Pandit | 13 | - - |
| *Sida acuta* (Bala)                  | Malvaceae | Throughout the warmer parts of India | Whole plant | Shivering, joint pain | Jaiswal et al, Mulay et al, Sharma, Sebastian | 14, 17, 40, 41, | - - |
| *Syzygium aromaticum* (Lavang)       | Myrtaceae | Cultivated in Tamil Nadu and Kerala | Flower bud | Carminative, anti inflammatory, antibacterial, in dyspepsia, gastric irritation | Choodnal | 37 | √ - |
| *Terminalia arjuna* (Arjuna)         | Combretaceae | Throughout the greater part of India, also grown as an avenue tree | Bark | Haemostatic property, tissue healing, heart diseases | Jaiswal et al, Singh et al | 14, 27 | √ - |
| *Terminalia bellirica* (Bhibhitaki)  | Combretaceae | Throughout deciduous forests of India | Fruit | Diarrhoea, dyspepsia | Pande et al | 12 | √ - |
| *Terminalia chebula* (Haritaki)      | Combretaceae | Abundant in Northern India. Also occurs in the forests of Assam, West Bengal, Bihar especially in Konkan | Fruit | Diarrhoea, anthrax, dysentery, ulcer, stomachache, anorexia | Pandit, Phondani et al, Sadangi et al, Pal and Jain, Varshney, Sudarsanam et al, Chintu et al, Rajan and Sethuraman | 4, 13, 16, 20, 24, 29, 33, 39 | √ - |
| *Trachyspermum ammi* (Ajwain)       | Apiaceae | Cultivated in Madhya Pradesh, Andhra Pradesh, Gujarat, Maharashtra, Uttar Pradesh, Rajasthan and Bihar | Seeds | Hypocalcemia downer cow syndrome, expectorant, appetizer, indigestion, dysentery, stomachache, fever, blot | Pandit, Phondani et al, Takhar, Varshney, Mishra et al, Yadav and Gupta, Geetha et al | 4, 11, 13, 24, 38, 42, 43 | √ - |

*Contd...*
aspects of production from the starting materials, premises, and equipment to the training, safety measures and personal hygiene of the staff. It also ensures that proper standard operating procedures are followed; the work environment is controlled; and quality assurance, packaging, and labeling are done in accordance with the requirements.

[47,48] Various pharmacopoeias including the IP, Chinese Herbal Pharmacopoeia, British Herbal Pharmacopoeia, BP, USP, European Pharmacopoeia, Japanese Standards for Herbal Medicine, and the Ayurvedic Pharmacopoeia of India have monographs of many herbs used for human care, but none of them state the herbal monographs used as veterinary medicines. Thus, these pharmacopoeias may also consider laying down monographs for herbs and herbal preparations specifically used in veterinary medicines so as to maintain their quality.

**CONCLUSION AND PROSPECTS**

It is evident that most medicines mentioned in this review for animal health care are derived from leaves. Generally, fresh collected plant or plant parts are used for treatment. Figure 2 illustrates the percentage of different parts of plants used as veterinary medicines. Out of 57 crude herbs and 47 processed herbs/excipients in IP 2014, 40 crude herbs and 5 processed herbs/excipients are covered here. Among the 45 herbs mentioned, 18 are official in BP 2014 and 11 in USP 36. Thus, this article covers the wide scope of herbal drugs that can be used in the treatment of human diseases. Manufacturers are encouraged to use the IP standards with respect to these herbal medicines for the manufacture of veterinary herbal formulations.

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**Table 2: Contd...**

| Botanical name/ local name of the plant | Family | Habitat | Parts of plant used | Reported indications | Authors | References | Pharmacopoeial status |
|----------------------------------------|--------|---------|---------------------|----------------------|---------|------------|-----------------------|
| Tinospora cordifolia (Guduchi)         | Menispermaceae | Tropical India and the Andamans | Whole plant | Tonsilitis, foot and mouth disease, anthrax, bone fracture, blood purification, Skin disease | Ashok and Reddy, Galav et al, Ashok S, Kumar, Mulay et al | 15, 17, 19, 22, 22 | - - |
| Tribulus terrestris (Gokhru)           | Zygophyllaceae | Throughout India, up to 5,400 m | Root | Dysentery | Ashok and Reddy | 22 | - - |
| Trigonella foenum-graecum (Methi)      | Fabaceae | Widely cultivated in many parts of India | Seeds | Urinary disorder, appetizer, diuretic, galactagogue, fertility regulation and in the treatment of gastric troubles, tetanus, and food poisoning, pneumonia | Phondani et al, Takhar, Varshney, Singh et al, Sudarsanam et al, Wanzala et al | 4, 11, 24, 27, 29, 44 | √ - |
| Withania somnifera (Ashwagandha)       | Solanaceae | Distributed throughout the drier region of India, especially in Wasteland ascending to an altitude of 2000 m in the Himalaya | Root | Fever, ulcer, expulsion of placenta, convulsive seizures, tissue healing, antibacterial, improve sexual vitality | Jaiswal et al, Pandit, Galav et al, Pal and Jain, Ashok and Reddy, Mulay et al, Mishra et al, Wanzala et al | 13, 14, 15, 17, 20, 22, 24, 30, 44 | √ √ |
| Zingiber officinale (Ginger)           | Zingiberaceae | Native to Southeast Asia; cultivated mainly in Kerala, Andhra Pradesh, Uttar Pradesh, West Bengal, Maharashtra | Rhizome | Blood purifier, expectorant, fever, indigestion, anthrax, constipation, stomachache, tetanus, food poisoning | Sudarsanam et al, Varshney, Chintu et al, Wynn, Wanzala et al | 24, 29, 33, 35, 44 | √ √ |
|                                        |         | Flower, fruit |              | Bone fracture, diarrhoea | Pandit | 13 |         |
The data also revealed that plant preparations were used to treat a wide range of conditions such as cough, cold, diarrhea, dysentery, bone fractures, wounds, rheumatism, hair loss. Some of the drugs also have multiple indications in animal health care (Allium cepa, Azadirachta indica, Curcuma domestica, Piper nigrum, Trachyspermum ammi, Trigonella foenum-graecum, and Zingiber officinale).

In spite of the extensive modern programs implemented by government organizations and hospitals to uplift rural health care, these traditional treatments have remained popular. In some remote areas, people have great undocumented traditional knowledge about animal diseases, herbal treatments, formulations, etc., But due to modernization, this traditional veterinary knowledge is on the verge of extinction. The only means of acquisition of this knowledge is from what has been passed down over the generations and the lack of interest for traditional veterinary knowledge in the present generation is leading to its extinction.

Therefore, there is a need to prioritize the veterinary herbal sector. The herbal veterinary medicines are mainly sold at a relatively low cost as compared to modern medicines. While the herbal products are cheaper, the active ingredients of the medicinal plants are becoming increasingly expensive. As a result, herbal veterinary medicines are losing their edge over the allopathic drugs. Thus, there is also an urgent need to encourage research in this sector. Moreover, the quality specifications of veterinary herbal medicines need to be developed and the possibility of harmonization/collaboration efforts may be explored to take care of animal health care at the national and international levels. It can thus be concluded that there is still a need for both the validation of traditional claims (detailed pharmacognostical, phytochemical, and pharmacological investigations, etc.) and safety evaluations in appropriate models of these medicinal plants for their development and use as veterinary medicines.

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