CHAPTER 07

Ethnoveterinary Medical Practices: An Alternative to Antibiotics in the Animal Health Sector

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SUMMARY

Animal plays a significant role in the country's economy. Ethno-veterinary medicines refers to the use of traditional medical practices for the management of animal diseases. These include medicinal plants, herbs, and other bio-active substances to promote animal health. The occurrence of antibiotic resistance due to the over-usage of antibiotics in the animal sector is a major problem as it imposes an undesirable impact on the environment and human health. This occurrence of antimicrobial resistance in human health is considered a silent pandemic and causes severe health consequences. Ethno-veterinary medicine provides a cost-effective and sustainable alternative to antibiotics. These traditional herbal medicines can promote animal health by treating respiratory, digestive, and parasitic infections without depending on antibiotics. Furthermore, these medicines also have the potential to promote the preservation of species of medicinal plants and biodiversity. By utilizing traditional knowledge and practices, local communities can play a dynamic role in the sustainable management of natural resources.

INTRODUCTION

The use of traditional medicine in the field of veterinary medicine is known as ethno-veterinary medicine [EVM (Temeche et al., 2020)]. It is the branch of science exploring the use of medicines (Oyda, 2017), surgical methods and techniques, and conventional management procedures used for the treatment and prevention of animal diseases (Oliveira et al., 2021).

Ethno-veterinary medicine involves the systematic investigation of the interactions between plants and animals in the context of traditional knowledge and practices (Teklay, 2015). It is an integrated multidisciplinary knowledge of local, anthological structures and environment linked with animal welfare and livestock farming (Eshetu et al., 2015). It is the body of complex elements comprising, theories, folk dogmas, skills, practices, knowledge, and experience, which are transferred horizontally or vertically through generations (principally verbally or through the application of hands-on skills), and are used in animal healthcare (Bartha et al., 2015). This complex network of practices and knowledge is the fundamental element in many rural parts of the world and is used for ensuring animal health, thereby the subsistence of both rural and agricultural communities (Fullas, 2010). In pastoral zones of the world, plants are essential for the survival of indigenous communities. According to World Health Organization (WHO) statistics, around 80% of the global population is reliant directly on plant resources for health (Puri et al., 2019). Traditional herbal medicines have retained their status in less industrialized countries; however, their use now is increasing rapidly in developed countries (Oliveira et al., 2021). The usage of medicinal plants is predominant in China, India, and Pakistan, with a history of traditional practices for plant-based remedies dating back at least 7,000 years (Iqbal et al., 2005). Developing countries are mainly dependent on medicinal plants for curing animal diseases for several important reasons (Fullas, 2010): (i) Medicinal plants are cheaper and effective treatment regimens (McGaw et al., 2020); (ii) They are used as an alternative to antibiotics which have detrimental effects on animal breeding and food products of animal origin (Merwe, 2010); (iii) They promote bio-cultural tradition; (iv) and lastly to explore the association between human and animal plant uses so as to probably evaluate the roots of herbal medicines (Maphosa et al., 2010).

How to Cite: Abubakar M, S Manzoor & Z Syed, 2023. Ethnoveterinary medical practices: an alternative to antibiotics in the animal health sector. In: Complementary and Alternative Medicine: One Health Perspective (Sindhu ZuD, B Aslam, U Uslu & M Mohsin, eds): FahumSci, Lahore, Pakistan, pp: 47-55. ISBN: 978-627-7745-01-1. https://doi.org/10.61748/CAM.2023/007

Ethnoveterinary medicine can serve as a vital tool for animal production and improving livelihoods in impoverished rural areas. It is often the sole alternative available for farmers to treat ill animals. In the late 1930s, it was noticed that cattle consuming spoiled sweet clover suffered from hemorrhages (Khan et al., 2019). Upon investigation, it was determined that the chemical responsible for this effect was dicoumarin, which is now marketed under the tradename dicoumarol. Link Stabmann and Huebner synthesized this anticoagulant agent in 1941, and it was subsequently used to great benefit. Therefore, to facilitate the sharing and adoption of various conservation measures and the utilization of plants for animal healthcare, it is crucial to record and distribute indigenous knowledge (Khan et al., 2019).

THE CURRENT STATE OF ANTIBIOTIC USE IN THE ANIMAL HEALTH SECTOR

The use of antimicrobial agents is of great significance in medical practice. These substances, which can be naturally produced by living organisms or artificially created in laboratories, can be administered through oral, parenteral, or topical means to kill (bactericidal) or restrict (bacteriostatic) the microorganism's growth (Milić et al., 2013). Antibiotics are typically employed to treat, or inhibit infections (Islam, Saifuddin, et al., 2016), but are also utilized for non-treatment purposes such as enhancing feed efficiency and promoting growth in many continents (Bacanlı et al., 2019). Currently, nearly 80% of farming animals and fowls receive medicine for a portion or the entirety of their lives, and in the USA, the usage of antimicrobials in breeding animals accounts for 80% of the country's annual antimicrobial consumption (Obimakinde et al., 2017). In the past, developed countries such as the USA and some European nations were the primary users of antimicrobials in food animals (Elliott et al., 2017). However, at present, antimicrobial use has escalated dramatically in livestock in developing countries in the Southeast Asia region, including Myanmar, India, Bangladesh, Nepal, Bhutan, Indonesia, Sri Lanka, and Thailand (Founou et al., 2016; Walther et al., 2016). Approximately 94.16% of chicken farmers in Bangladesh utilize antimicrobials in their ranches (Ferdous et al., 2019). The most frequently employed antimicrobials for food animals are tetracyclines, amphenicols, β-lactams, aminoglycosides, quinolones, lincosamides, macrolides, polypeptides, and sulfonamides (Cháfer-Pericás et al., 2010; Marshall et al., 2011). On average, the expected usage of antimicrobials in swine, poultry, and cattle is predicted to increase by 67% by 2030 (Hosain et al., 2021).

Antimicrobials are primarily utilized to foster animal health and prevent the transmission of diseases in poultry and animals (Boamah et al., 2016). However, their use in growth escalation in animals (Elliott et al., 2017), feed efficiency enhancement (Boamah et al., 2016), and prophylaxis is a subject of debate due to the potential contribution to antimicrobial resistance [AMR (Lekshmi et al., 2017)]. Around 94.16% of fowl farmers in Bangladesh utilize antibiotics in their granges to control diseases and improve egg production, as reported by (Ferdous et al., 2019). Furthermore, local pharmaceutical companies are responsible for producing more than 70% of antibiotics used in the animal industry (Anesary et al., 2014). Most ranchers in commercial poultry obtain antibiotics directly from feed sellers, companies, or suppliers, without the involvement of veterinarians. Over-the-counter sales constitute a significant proportion of antibiotics given to farm owners or customers. (Masud et al., 2020) indicated that 60% of farmers utilize antibiotics without a prescription.

Administration of antimicrobials to animals producing feed may result in the presence of remains in food products like eggs, meat, and milk which could lead to health concerns (Islam, Shiraj-Um-Mahmuda, et al., 2016). These health concerns may range from severe issues like hypersensitivity reaction, allergy, mutagenicity, and carcinogenicity to less severe issues like change of microflora and the possible development of AMR (Hassan et al., 2014). Fresh meat and milk products are often contaminated with commensal bacteria that originate from food-producing animals. These bacteria may act as a repository for resistant genes that could be passed to pathogenic organisms in humans (Neogi et al., 2020).

Antimicrobial use in low doses as growth enhancers in food animals creates a favorable environment for the emergence of antimicrobial resistance. The degree of resistance observed in a population of microbes in animals is positively connected with the amount of antimicrobial used in that population (Roth et al., 2019). The unnecessary usage of antibiotics such as penicillin, chloramphenicol, tetracycline, sulfonamides, and fluoroquinolones in poultry has led to high levels of resistance in *E. coli* against these antibiotics (Roth et al., 2019). Moreover, the frequent administration of sub-therapeutic doses of antimicrobials leads to alterations in the gut microbiota and facilitates the proliferation of microorganisms and resistant genes, not only targeting the specific class of antimicrobial but other antimicrobials also (Looft et al., 2012).

AMR, or antimicrobial resistance, a global threat, is believed to be significantly influenced by the excessive utilization of antibiotics in animals in recent times (Masud et al., 2020). Antibiotic resistance encompasses two main factors. The first one involves the transmission of AMR pathogens through the food chain, as well as the transfer of AMR genes from animal enteric flora to human pathogens. The second factor relates to the decreased effectiveness of antibiotic treatment in animals harboring resistant bacteria (Low et al., 2021). Hence, it proved that some human enteric pathogens have developed resistance

by acquiring resistant bacteria or resistance genes from animals through the food chain or via exposure to contaminated surroundings (Neogi et al., 2020).

ETHNO-VETERINARY MEDICINE AS AN ALTERNATIVE TO ANTIBIOTICS

For centuries, plants have been used for numerous purposes such as providing feed, food (Bussmann et al., 2021), fiber (Shaheen et al., 2020), and shelter to both humans and animals. In addition, they have been used to manage and alleviate not only human but also animal diseases (Güler et al., 2021). Ethnoveterinary medicine is particularly significant in the animal production industry and in the improvement of livelihoods, particularly in far-flung areas (Chaachouay et al., 2022). In many cases, it is the only available option for farmers to treat their ill animals (Hassen et al., 2022). McCorkle and Schilihorn-van-Veen define ethnoveterinary medicine (EVM) as the methodical examination and implementation of traditional knowledge in both the theoretical and practical aspects of the field (McCorkle et al., 1996).

Ethno-medicines have garnered increased global attention in recent years due to their low-risk profiles compared to antibiotics. Additionally, phyto-veterinary medicines and formulations are more cost-effective (Raza et al., 2014). However, access to veterinary practices is limited for some communities in modern society. In these cases, (EVM) serves a vital role in many societies and regions of the world. The use of modern drugs derived from vegetal matter is an alternative and more sustainable method for treating both animals and humans (Shtayeh et al., 2016).

Livestock is an essential source of raw materials for the food industry in Pakistan, with milk being the most crucial. According to estimates, 75% of Pakistan's poor and food-insecure population live in pastoral areas and depend on agriculture, primarily on income generated from milk production (Amber et al., 2018). Antibiotics are mainly used worldwide to treat livestock-associated diseases, but many pathogens have acquired resistance to different antibiotics. This resistance has led to potential health hazards for consumers due to drug residues in milk, which can cause allergic responses, disturbance of normal flora, and the development of antibiotic-resistant bacterial populations in the general population, making antibiotic therapy ineffective (Bharti et al., 2012). There are bacteria that have demonstrated resistance to multiple antibiotics, such as *Escherichia coli* and *Klebsiella pneumoniae* resistance to third-generation cephalosporins, and carbapenems, and *Staphylococcus aureus's* resistance to β-lactam drugs (Padmini et al., 2017).

The rise in the potential for drug-resistant pathogens, combined with the high cost and adverse effects of antibiotics, has piqued the interest of both scientists and the general population in exploring the potential of ethnomedicinal plants to discover useful compounds (Murad et al., 2014). In the northwest region of Pakistan, various plant species such as *Allium sativum* (Mussarat et al., 2014), *Morus nigra* (Aziz et al., 2018), *Withania coagulans*, and *Triticum aestivum* have been traditionally used for treating mastitis, mouth and foot ulcers, abdominal pain, and diarrhea, etc. (Aziz et al., 2020).

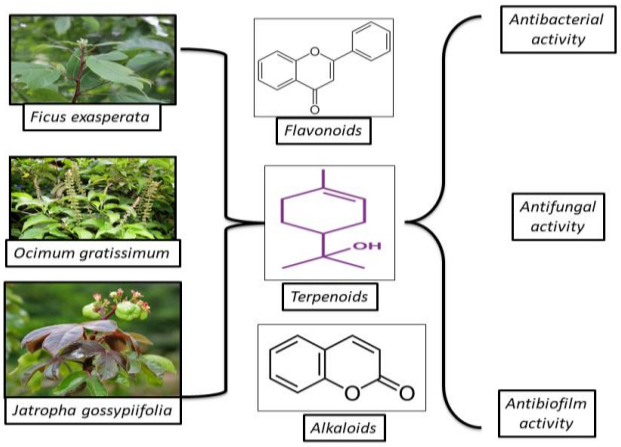

Fig 1. Insights of the antimicrobial activity of different medicinal plants.

The increasing prevalence of diseases and the advancement of scientific understanding regarding ethnomedicine have led to the acceptance of plant-derived therapeutic agents as viable alternatives or complementary treatments for various diseases (Stéphane et al., 2021). Numerous research works have demonstrated the presence of flavonoids, coumarins, terpenoids, tannins, alkaloids, essential oils, phenolics, lectin, polyacetylenes, and polypeptides in medicinal plants (Gadisa et al., 2021). These bioactive compounds have been utilized as a basis for the synthesis of antibiotics for the treatment of communicable diseases (Bashir et al., 2021). *Polygonum plebejum*, *Polygonum persicaria*, *Rumex dentatus*, *Rumex hastatus*, *Rheum austral*, and *Rumex nepalensis*, are crude extracts that exhibit antibacterial and antifungal properties and can impede the growth of *S. aureus*, *C. freundii*, *E. coli*, and *E. aerogenes*, (Romha et al., 2018). The n-hexane extracts of *Calotropis gigantea* do not possess any antibacterial or antifungal properties against pathogenic microorganisms. However, its ethyl-acetate fraction has demonstrated inhibitory effects against certain bacteria and fungi, excluding *T. rubrum* (Kim et al., 2020). In Asia, *Calotropis gigantea* crude extracts have shown promising antifungal activity against pathogenic fungi including, *Rhizopus oryzae*, *Aspergillus niger*, *Aspergillus ustus*, *Aspergillus ochraceus*, and *Candida albicans* (Bashir et al., 2021). An effective antimicrobial activity was demonstrated

by the ethanolic extract of roots of *Plumbago zeylanica* against *E. coli*, *V. cholerae*, *P. aeruginosa*, *Colletotrichum corchori*, *Fusarium equiseti*, and *Curvularia lunata* (Chuah et al., 2014). Moreover, the watery leaf extract of *Erythrophleum suaveolens* and *Euphorbia hirta*, and the methanolic leaf extract of *Thevetia peruviana* have been found to possess antibacterial properties against ESBL (Extended spectrum β- lactamase)-producing bacteria such as *P. aeruginosa*, *K. pneumoniae*, MRSA, *E. coli*, *Proteus*, and *Salmonella* (Niranjan et al., 2017).

The emergence of antimicrobial-resistant poultry pathogens has resulted in ineffective treatment and economic losses, as well as posing a risk to human health by potentially causing resistant zoonotic infections. In response, the European Union banned the usage of antibiotics as growth enhancers for livestock in 2006. To reduce the prevalence of pathogens in the food chain, alternative strategies and products are being explored to maintain animal gut flora. The antibacterial and antifungal properties of organic and aqueous leaf extracts of *Ficus exasperata*, *Morinda lucida*, *Acalypha wilkesiana*, *Alchornea laxiflora*, *Ocimum gratissimum*, and *Jatropha gossypiifolia* were tested by (Olawuwo et al., 2022) against bacterial poultry pathogens such as *S. aureus*, *E. faecalis*, *E. coli*, *Campylobacter spp*, *Salmonella spp*, as well as fungal species including *A. flavus*, *A. fumigatus*, and *C. albicans*. Additionally, the antibiofilm activity of plant extract was also evaluated. The study found that all plant extracts demonstrated effective anti-biofilm activity (>50%) against one specific organism. However, it was more challenging to disrupt conventional biofilm growth using the plant samples than to combat free-living forms of bacteria. These findings suggest that some of the plant species could be considered as an alternative option in poultry.

STATUS OF ETHNO VETERINARY MEDICINES IN PAKISTAN

Tab 1., summarizes different ethno-veterinary medicines used in different regions of Pakistan for curing animal diseases. The livestock industry is a significant component of agriculture in Pakistan, accounting for 56.3% of agriculture and almost 11% of the agricultural gross domestic product (AGDP). The primary product is milk, and Pakistan is the fourth-largest milk producer globally, after China, India, and the USA. (Rehman et al., 2017). This sector is crucial for poverty reduction strategies and has the potential for rapid development. According to a government economic survey, the national herd includes 53.8 million goats, 29.6 million cows, 26.5 million sheep, 27.3 million buffalo, and 0.9 million camels (Pakistan, 2010). Despite employing over 35 million people, the livestock sector has only experienced an average growth of 2.9% over the past three decades due to poor economic policies. The sector produces meat, milk, eggs, manure, fibers, hides, and horns, with demand for these products rapidly increasing due to population growth, urbanization, and increased revenue. Although often criticized, the livestock sector plays a vital role in the country's economy by providing valuable organic animal proteins, draught power, and other by-products (Manzoor et al., 2019). Moreover, draught power and manure provided by the

Tab 1. Ethno-veterinary medicines for the treatment of different animal diseases in Pakistan.

Plants	Location	Province	Part of the plant used	Animal treated	Condition treated	References
Acacia modesta	Chamla valley	KPK	Gum	Domestic animals	Indigestion	(Khan et al., 2019)
Aesculus indica			Fruit		Abdominal pain	
Cannabis sativa			Leaves		Redwater	
Brassica nigra			Plant		Placenta retention	
Apluda mutica L.	Gujrat	Punjab	Aerial	Livestock	Stomach ache	(Majeed et al., 2020)
Chrysopogon aucheri (Boiss.)			Leaves	Bull	Digestive problems, fertility-related issues	
Sorghum halepense (L.) Pers			Roots	Livestock	Infectious diseases	
Dicliptera bupleuroides Nees	-	Punjab	Whole plants	Cow, buffaloes	Pneumonia	(Abidin et al., 2021)
Acorus calamus L.	-	KPK	Rhizome	Cow, sheep, goat	Anaplasmosis, mastitis, dysentery	
Asparagus officinalis L.	-	KPK	Leaves and buds	Donkey, camel	Trypanosomiasis, scabies	
Allium sepa L.	North Waziristan	KPK	Seed	Cow, sheep	Abdominal worms	(Rehman et al., 2022)
Caloptropis procera R.			Fruit and leaves	Cow, buffalo	Skin infections	
Aloe vera gel			Aerial parts	Sheep	Respiratory problems	
Citrullis colocynthyis L.			Fruit	Horse	Rheumatic arthritis	
Capsicum annuum L.	Neelum Valley	Kashmir	Fruit	Horse	Respiratory infections	(Khan et al., 2021)
Curcuma Longa L.			Roots	Cow	Uterus infection	

animals increase the quantity of organic matter to improve land fertility and productivity. Additionally, more than 10 million animals are involved in agricultural activities and events (Rahman et al., 2020).

Over the past two decades, several field veterinary ethnobotanical studies have been carried out in different regions of Pakistan and hundreds of medicinal plants have been utilized in veterinary systems. Those residing in mountainous and marginal regions, such as shepherds, have developed particular expertise in caring for their animals through medicinal plants.

ETHNO-VETERINARY MEDICINE: EXAMPLES OF PRACTICES

The therapeutic benefits of plants used in phytotherapy are attributed to the abundance of bioactive compounds present in the kingdom *plantae*. These active compounds, when extracted from plants, can have therapeutic effects that are comparable to antibiotics. Therefore, they are commonly used in veterinary medicine as antimycotics, antibacterials, disinfectants, antiparasitics, and immunostimulants (Russo et al., 2009).

In Italy, 70.5% of domestic animals are treated with medicinal plants, followed by 9.1% of poultry, 5.3% of dogs, and 4.3% of rabbits (Russo et al., 2009). Ethiopia utilizes various plants for veterinary medicine, including purga potato (*Operculina hamiltonii*), São Caetano's melon (*Mormodica charantia L.*), and seeds of Pumpkin (*Cucurbita pepo L.*), which are used as vermifuges (Serda, 2017). The mother tincture extracted from *Centella asiatica*, *Calendula officinalis*, and *Commiphora myrrha* can be beneficial for treating gingivitis. *Euphrasia officinalis* is given to treat conjunctivitis. To manage diarrhea in pets, chamomile infusion, carrot juice, and a 10% rice decoction are frequently used. Meanwhile, *Thymus vulgaris* essential oil is recommended for treating coughs in cats and dogs. Lastly, mother tinctures made from *Crataegus oxyacantha*, *Melissa officinalis*, and *Valeriana officinalis*, are often used to manage anxiety and stress, as well as to control behavioral and psychological problems in pets (Russo et al., 2009).

Numerous plants possess anti-parasitic properties that are beneficial for domestic animals. One effective flea repellent for topical treatment in dogs and cats is a spray containing oil of *Juniperus communis*. However, it is worth noting that this plant can be harmful to pets if ingested (Lans, 2019). An *in vitro* study demonstrated that a 10% decoction of *Matricaria chamomilla* dried flower heads exhibited 100% acaricidal activity against the mite *Psoroptes cuniculi*, which is one of the primary causes of otoacariasis in domestic animals (Chauhan et al., 2022). In many regions of Italy, farmers often employ various plants, including *Avena sativa*, *Brassica oleracea*, *Linum usitatissimum*, *Anagallis arvensis*, *Buxus sempervirens*, and *Scrophularia canina* for their anti-inflammatory and emollient properties, to either prevent or treat mastitis in cattle (Sooud, 2018).

The majority of studies in the literature examine the anti-parasitic properties of various plants, including *Anethum graveolens*, *Eucalyptus globulus*, *Allium sativum*, *Lavandula officinalis*, *Mentha piperita*, and forages in livestock, particularly in ruminants. These effects are believed to be a result of essential oils, and other active compounds such as alkaloids, terpenes, tannins, and glycosides found within these medicinal plants (Hrckova et al., 2012).

TOXICITY AND SAFETY OF ETHNOVETERINARY MEDICINES

The term “toxicity” pertains to the ability of a substance to produce adverse side effects in an organism. It can be either organo-toxic (organ) or cytotoxic (cell) (Mensah et al., 2019).

Medicinal plants are known for harboring unknown adverse reactions; however, they are known best for their efficacy. A few of the examples are listed in Tab 2. These medicinal plants have been rendered safe; they are widespread and hence used for self-medication without any prior consultation. Most of the time, individuals using medicinal plants also give these products to their pets without consulting a veterinarian. This behavior elevates the potential for unfavorable reactions, such as allergic responses (Severino, 2005). Additionally, although infrequent, interactions between traditional medicines and synthetic drugs may occur. This can lead to liver failure, kidney failure, and peptic ulcers, as the active ingredients' kinetics may be altered, increasing the risk of adverse effects. Finally, the safety of

Tab 2. Mode of the interaction of the medicinal plant with synthetic drug

Medicinal plants	Interaction seen in	Mode of interaction	Synthesized drugs requiring caution	References
Garlic extract	Dogs	Heinz bodies and eccentrocytes can form because of oxidative damage to erythrocytes	Anticoagulants	(Lee et al., 2000)
Freeze-dried garlic powder	Horses	Hemolytic anemia with Heinz bodies	Anticoagulants	(Pearson et al., 2005)
Liquorice	Rats	A rise in corticosteroid levels in the bloodstream and a decrease in the number of salicylates present in circulation.	Immunosuppressive drugs	(AkAo et al., 1992)

medicinal plants is significantly affected by their quality, as traces of environmental pollutants (such as heavy metals, mycotoxins, and radionuclides) found in phyto therapeutic products may cause negative reactions (Severino, 2005). Numerous studies can be discovered in the literature that inspects potential interactions (based on botanical species, and treatment) between the active components of a particular phyto-complex and synthetic medications.

The medicinal plants used as veterinary medicines are also known to pose toxic effects on the animals. Tab 3., describes some examples of associated toxicity of veterinary medicines:

Tab 3. Associated toxicities of veterinary medicines

Veterinary medicines	Composition	Used as	Toxic effects	References
Oil from *Mentha piperata*	Menthol, pulegone, menthone, limonene and menthofuran	Flea repellent	Pulegone can cause liver damage in rabbits and may result in cerebellum lesions in rats.	(Nair, 2001)
Oil from *Mentha pelgium*	Pulegone	Flea repellent	Diarrhea, vomiting, and epistaxis	(Sudekum et al., 1992)
Ephedra	Guarana and ma huang	Fat loss and diuretics	Seizures, hyperthermia, vomiting, hyperactivity, and behavioral changes in dog	(Ooms et al., 2001)
Artemisia absinthium (woodworm)	Thujone	Treatment of gastrointestinal nematodes	Convulsion in ruminants	(Poppenga, 2001; Tariq et al., 2009)
Raspberry leaf infusion	Chlorogenic acid, rutin, ferulic acid, p-hydroxybenzoic acid	Pregnancy and post-partum supplement	Altered reproductive functions in companion animals	(Johnson et al., 2009; Lans et al., 2009)

CHALLENGES AND LIMITATIONS OF ETHNOVET-ERINARY MEDICINES

Ezeanya-Esiobu suggests that certain ethnoveterinary remedies may be inconvenient to prepare or use because some of the necessary plants are only accessible at certain intervals of the year (Ezeanya-Esiobu, 2019). According to Miglas and Belachew, dosages for ethnoveterinary medicine are not standardized and are based on empirical evidence (Miglas et al., 2019). Gabalebatse et al. argue that standardizing ethnoveterinary medicine is challenging due to variations in the concentration of active ingredients in each plant, which are influenced by geographical and climatic factors; while ethnoveterinary medicine may not be as fast-acting or potent as conventional medicines (Gabalebatse et al., 2013). These should not be disregarded since many conventional drugs also have plant origins. Due to their potential slower onset of action and lower potency compared to conventional medicines, treating endemic and epidemic diseases like anthrax, foot-and-mouth disease, rinderpest, rabies, and black quarter, may not be the ideal use for ethnoveterinary medicines. (Zorloni, 2020) discussed that proper diagnosis is crucial for treating animals effectively, as many factors can cause similar symptoms, such as anorexia, restlessness, anxiety, and weight loss. Yirga et al. and Kubkomawa reported that inapt ethnoveterinary procedures such as vulva cauterization for heat induction using snake oil, may have a negative impact on animal health and should be discouraged (Kubkomawa et al., 2013; Yirga et al., 2012).

(Abraha, 2016) highlighted that the swift changes in people's lifestyles, including socio-economic, ecological, and technological advancements, are contributing to the abandonment or complete disappearance of traditional knowledge. Moreover, (Odongo et al., 2018) argued that traditional practices are often perceived as malevolent, demonic, immoral, and hence, irreligious, which worsens the situation. Furthermore, the absence of acknowledgment and validation of the crucial role played by ethnoveterinary experts in preventing, managing, and curing animal diseases in certain nations is another factor that discourages young individuals from preserving the conventional values of their community (Odongo et al., 2018).

CONCLUSION

In conclusion, ethno-veterinary medical practices hold immense potential as an alternative to antibiotics in the animal health sector. The use of traditional remedies derived from medicinal plants has shown promising results in the treatment of various animal diseases, including mastitis, which is a significant concern for dairy farmers worldwide. As traditional remedies have fewer side effects and are more affordable, they could provide a sustainable and cost-effective solution for farmers in low-income regions who are unable to access conventional veterinary practices. However, further research is needed to standardize the use of these remedies, identify their active compounds, and ensure their safety and efficacy. Overall, the incorporation of ethno-veterinary medicine into animal healthcare practices could help address the growing problem of antibiotic resistance while promoting sustainable livestock production and improving animal health and welfare.

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