

Documentation of Ethnoveterinary Practices in the Pothohar Plateau (District Chakwal), Pakistan

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Livestock farming is the major source of income for resource-poor people of the subcontinent region. To obtain maximum output from animals, the health and well-being of animals is important. However, due to the high cost associated with allopathic medicine, the indigenous people use their traditional knowledge of medicine for the treatment of various ailments of domestic animals. Such remedial practices are known as ethnoveterinary medicine. The farmers use different herbal plants against various livestock diseases such as tick infestation, fever, diarrhea, or allergy. Only a few studies in Pakistan have documented the use of medicinal plants for the treatment of ailments in animals. Therefore, keeping in view the importance of ethnoveterinary medicine, this study was planned to document the traditional practices of farmers in the district of Chakwal, Pakistan. An open-ended questionnaire was designed to conduct in-person interviews with local healers, veterinarians, and some old folk. The data from 68 respondents were recorded in a Microsoft Excel 365 spreadsheet. The results indicated that 31 plants known for their therapeutic potential belonging to 28 different families were used for the treatment of 21 most common diseases of animals. The nine plants were solely used to control tick infestation in livestock. The most frequently used plant for tick control was *Nicotiana tabacum* (80.88%). *Syzygium cumini* was most frequently used for the treatment of diarrhea in ruminants (94.11%). Furthermore, farmers used different preparations of plant parts depending on the desired effect against the disease in different vehicles, such as leaves and seeds in water or oil. The most common route of administration was oral. In conclusion, this study highlights major findings of ethnoveterinary practices which could serve as a hallmark in treating different ailments of animals. Moreover, to achieve maximum therapeutic effects of these medicinal plants, their efficacy, dosage, and toxicological effects in animals still need to be investigated.

Keywords: Ethnoveterinary medicine, medicinal plants, survey, Chakwal, traditional healers

INTRODUCTION

The major source of income for the people of the subcontinent region is livestock farming and resource-poor people rely on traditional knowledge of medicine and herbal remedies for the treatment of different ailments of animals. Ethnoveterinary medicine (EVM) refers to remedial practices, indigenous knowledge, and traditional beliefs of indigenous people for the well-being and treatment of different illnesses of animals (Rahman *et al.*, 2023; Al-Hoshani *et al.*, 2023). Furthermore, it has many advantages over allopathic medicine such as EVM is less expensive, herbal preparations are easily available in remote areas, and it has the potential to cure a wide variety of diseases of animals. Moreover, EVM also prevents the emergence of drug resistance, cost issues

associated with drugs, and the appearance of drug residues in the products of animals – meat, milk, and eggs – and consumers demand more organic food-producing animal products (Silva *et al.*, 2020; Aljohani *et al.*, 2023). Therefore, EVM has gained considerable interest in people employing livestock farming for the prevention and treatment of animal disorders in Europe, Asia, Africa, and America (Benitez *et al.*, 2012; Ahmad *et al.*, 2015).

The rearing of domestic animals in South Asia as a source of income is a long-standing practice. Indeed, livestock farming also plays a crucial role in the economy of developed and underdeveloped countries and is also a good source of animal proteins and milk (Suroowan *et al.*, 2017). In Pakistan, livestock is a major sector of agriculture and according to the 2021-2022 Economic Survey of Pakistan, livestock has a



62.68% share in agriculture and a 14.36% share in gross domestic product with a growth rate of 3.78% (Pakistan Economic Survey, 2022). Mostly, the small farmers in Pakistan have 5-6 animals per family and to meet the daily requirements of the family, the maximum production of the animals acts as a key role player in getting the required margin of profit (Batool *et al.*, 2023). Parasitism such as infestation with ticks, GIT parasites or protozoal infections, metabolic disorders, and/or diarrhea are the major problems faced by animals and lower productivity of animals (Naseer *et al.*, 2022; Zaheer *et al.*, 2022; Dang *et al.*, 2023). Therefore, to keep the animals healthy and increase their productivity, the control of diseases of animals is important.

To date, numerous reports have indicated the usefulness of medicinal plants and their activity against various animal diseases (Sindhu *et al.*, 2010). For the treatment of colic, GIT parasites, fever, allergy, pain, and inflammation, the most used plant - parts, essential oils, extracts, or their herbal preparations (powders) - include *Paeonia emodi*, *Ferula assafoetida*, *Ricinus communis*, *Tamarindus indica*, *Woodfordia fruticosa*, and *Ziziphium nummularia* (Upadhyay *et al.*, 2011; Sindhu *et al.*, 2012; Parthiban *et al.*, 2016; Widowati *et al.*, 2022). Plants like *Abutilon indicum*, *Arisaema jacquemontii*, *Bauhinia variegata*, *Cassia fistula*, and *Cassia auriculata* are known for their potential for the treatment of diarrhea, dysentery, or gastric problems (Khan and Hanif, 2006; Abbasi *et al.*, 2013; Ahmed and Murtaza, 2015; Parthiban *et al.*, 2016). Similarly, the plants that are used as acaricidal, anthelmintic, or anti-protozoal include *Aerva javanica*, *Amaranthus viridis*, *Azadirachta indica*, *Allium sativum*, and *Zea mays* (Farooq *et al.*, 2008; Sindhu *et al.*, 2010; Abbasi *et al.*, 2013; Ahmed and Murtaza, 2015). The use of different plants is a common practice of indigenous people and is considered an integral part of EVM. In addition to this, Indigenous people are still practising EVM in remote areas and underdeveloped countries of the world, and underdeveloped countries of the world and very little or no attention has been given to such remedial practices in developed countries. In Pakistan, the EVM remains inadequately documented and draws the attention of researchers about its extension in the future. Therefore, this study aims to systematically document these practices and evaluate their relevance to contemporary veterinary medicine, particularly in under-researched areas like Chakwal.

MATERIALS AND METHODS

Study area: The present study was conducted in Chakwal, which is located in the Pothohar Plateau of Punjab, Pakistan, and it has a total area of 1,864,934 acres with an elevation of 498 meters above sea level. Chakwal is located at a latitude of 32°56'21"N and longitude of 72°51'21"E and is bordered by Rawalpindi in its northeast, Khushab in its south, Mianwali in its west, Jhelum in its east, and Attock in its northwest.

Study design for the assessment of ethnoveterinary practices: An open-ended questionnaire was designed by following the guidelines of Sindhu *et al.*, (2010) to gain an insight into ethnoveterinary medicinal practices of the indigenous people of the district Chakwal. Briefly, the survey was conducted with a local guide in a manner to identify the knowledgeable and experienced individuals who were involved in ethnoveterinary practices. For this purpose, respondents were selected through purposive sampling, targeting individuals with known expertise in local healing practices. Local healers, veterinarians, and some old folks were contacted, and the questions were asked which were related to the use of medicinal plants especially those having antiparasitic activity, and their dosage regimens.

Data analysis and management: The collected ethnoveterinary data were entered into a Microsoft Excel 365 spreadsheet for further evaluation and record keeping.

RESULTS

The data regarding the general information were obtained from practicing veterinarians, old folk, and local healers about the ethnoveterinary practices being carried out in the district Chakwal. Based on the criteria, 68 respondents provided information about the medicinal plants used for the ailments of animals were recorded. The 31 medicinal plants belonging to 28 different families with their botanical names, families, and recipes for the control of different ailments of animals were documented. The 21 common ailments for which traditional medicine was usually prescribed in district Chakwal include tick infestation, mange, mastitis, wound, pain, toxicity, dermatitis, cough, constipation, gastric disturbance, GIT parasites, udder inflammation, red water, lumpy skin disease, abdominal pain, myiasis, colic, calcium deficiency, pyometra, and allergy. Out of 31 medicinal plants, 9 medicinal plants were used for the control of ticks. Based on the survey, seeds of *Trachyspermum (T.) ammi* and *Peganum (P.) harmala* were the most preferred plants after *Nicotiana (N.) tabacum* (55/68) for the control of tick infestations in animals (40 respondents out of 68). The order of respondents for medicinal plants against tick control includes naswar (12/68), *Citrus limon* (21/68), *Eucalyptus globulus* (28/68), *Eruca sativa* (29/68), *Lepidurum sativum* (33/68), *Ocimum basilicum* (34/68), *T. ammi* (40/68), *P. harmala* (40/68), and *N. tabacum* (55/68). Only one plant, *Aloe vera*, was used for treating gastrointestinal parasites of the animals. Four plants were used for the treatment of diarrhea and the order of respondents was *Salvadora oleoides* (21/68), *Oryza sativa* (29/68), *Sesamum indicum* (40/68), and *Syzygium cumini* (64/68). *Syzygium cumini* is the most frequently used plant (64/68). The lowest number of respondents (12/64) indicated the use of naswar against tick infestation in animals. The remaining plants with their effects are provided in Table 1.

Table 1. Medicinal plants based recipes used for treating different ailments of animals in the district of Chakwal, Pakistan

Family	Local name (Urdu)	Common name (English)	Botanical name	Flowering season	Part used	Disease used for	Recipe	No of respondents
Myrtaceae	Safeeda/laachi	Eucalyptus	<i>Eucalyptus globulus</i>	Whole year	Leaves	Tick infestation	Grind the leaves and mix the paste with water then put on the skin	28/68
Apiaceae	Ajwain	Carrom seeds	<i>Trachyspermum ammi</i>	Winter	Seed	Tick infestation	Mix the seeds with feed and administer them to the animal	40/68
						Mange	Mix 50 grams with 50 grams of black pepper and dilute in 259ml of molasses then administer orally for 2-3 days	18/68
Lamiaceae	Niazbo	Basil	<i>Ocimum basilicum</i>	Summer	Flowers	Tick infestation	50 grams of flowers ground and mixed with 250ml water and put on the infested area	34/68
Rutaceae	Leemon	Lemon	<i>Citrus limon</i>	July-Sept	Peel	Tick infestation	Lemon peel will be rubbed on the skin	21/68
Amaryllidaceae	Thom	Garlic	<i>Allium sativum</i>	Mar-Apr	Fruit	Mastitis	Cook 250 grams with milk and give it to the animal	50/68
	Piaz and haldi	Onion and turmeric	<i>Allium cepa</i> and <i>Curcuma longa</i>	Apr-May		Wound	Cook 100 grams each in vegetable oil and put the paste on the wound	40/68
						Pain	Give 100grams raw turmeric per oral	21/68
Fagaceae	Aak	Oak	<i>Quercus incana</i>	Whole year	Leaves	Toxicity/dermatitis	Put oak leaves milk on the infected area	62/68
Brassicaceae	Haalia	Garden cress	<i>Lepidum sativum</i>	Winter	Seeds	Tick infestation	Give 100grams of seeds to the animal per oral	33/68
Meliaceae	Neem	Neem tree	<i>Azadirachta indica</i>	Whole year	Leaves	Stomach disorders	Give 200 grams of neem leaves for stomach dysfunction	57/68
Nitrariaceae	Harmal	Harmal	<i>Peganum harmala</i>		Seeds	Ticks infestation	Put seeds of harmal on the fire source and treat tick affected area with smoke	40/68
Brassicaceae	Tara mera	Taramira oil	<i>Eruca sativa</i>	Whole year	Seeds	Tick infestation	Give a cake of taramira with food/ rub the oil on the skin for prevention from ticks. Place oil on tick affected area	29/68
						Stomach pain	Add oil with lukewarm water then administer to animals	30/68
Apiaceae	Saunf	Sniffle	<i>Foeniculum vulgare</i>	Apr-May	Seeds	Cough	Give 100 grams boiled with water and administer po	52/68
Fabaceae	Desi kikar	kikkar	<i>Acacia nilotica</i>	Whole year	Leaves	Constipation	Grind 100grams seeds of the tree and administer them to animals	44/68
						Indigestion	100-gram leaves mix with 100-gram of sugar then administer po.	50/68
Solanaceae	Dara mirch	Red chili	<i>Capsicum annuum</i>	Jul-Aug	Fruit	Udder inflammation	Grind 150 grams and mix with wheat flour, then administer to the animals	58/68
Brassicaceae	Mooli k bhej	White reddish	<i>Raphanus sativus</i>	Dec-Mar	Seeds	Redwater	Give seeds 100 grams of seed to animals	16/68
Asphodelaceae	Kawar gandal	Aloe vera	<i>Aloe vera</i>	Evergreen	Leaves	GIT parasites	Give one leaf to the animals once and repeat after 7 day/s	44/68
Lythraceae	Anar	Pomegranate	<i>Punica granatum</i>	Sep-Nov	Fruit peel and seeds	Cough	Mix 125 grams of peel and seed then add with butter and administer po.	50/68
Solanaceae	Doda paneer, green chili, and onion	Indian cheese maker	<i>Withania coagulans</i>	Jan-Apr	Flowers	Viral infection (lumpy skin disease)	Mix 200grams each and give the animal 1 tablespoon 4-5 times a day	45/68
Apiaceae	Soye	Dill seeds	<i>Anethum graveolense</i>	Oct-Nov	Seeds	Abdominal pain	Give 100 grams of seed with water to the animal for abdominal pain	21/68
Pinaceae	Cheer oil	Pine oil	<i>Pinus sylvestris</i>	Winter	Fruit	Wounds	Put the oil in the affected area 2-3 times a day	54/68
Myrtaceae	Jaman	Java plum	<i>Syzygium cumini</i>	Jun-Aug	Leaves	Diarrhea	Give 100-150 grams of jaman leaves to animal 2-3 times a day	64/68
Lauraceae	Mushk kafoor	Camphor	<i>Cinnamomum camphora</i>	Evergreen	Barks and stem	Myiasis	Mix 10grams in water then put the paste on the wound	52/68
	Naswar	Naswar	-	Whole year	Whole product	Tick infestation	Mix 100gm naswar with 100 ml oil and apply topically	12/68
Solanaceae	Tambakoo	Tobacco	<i>Nicotiana tabacum</i>	Oct-Dec	Leaves	Tick infestation	Boil 250 grams of leaves in 11 water and apply topically on the tick-infested area.	55/68
						Colic in equines	Mix 250 grams with half-liter molasses and administer po.	25/68
Cucurbitaceae	Kor tumma	Bitter apple	<i>Citrullus colocynthis</i>	Jan-Oct	Fruit	Allergy	Mix one fruit with a tablespoon of common salt then administer orally for 3 days	30/68
Poaceae	Jawar	Sorghum	<i>Sorghum bicolor</i>	Sept-Oct	Fruit	Calcium deficiency	Mix 100gm of fruit with 100 grams of common salt and administer orally for 7 days	16/68
Salvadoraceae	Peelkan	Pilkhan tree	<i>Salvadora oleoides</i>	Evergreen	Leaves	Colic	Boil 500grams of leaves in water then administer po to horse/donkey	43/68
						Diarrhea	Mix 100grams leaves with jaman leaves then give to animal	21/68
Zingiberaceae	Haldi	Turmeric	<i>Curcuma longa</i>	Sept- Nov	Fruit	Infectious wound/pyometra	Give 100grams of turmeric to anima for 3 days	60/68
Pedaliaceae	Til	Sesame seeds	<i>Sesamum indicum</i>	Summer	Seeds	Diarrhea	Mix 250-gram seed with 500 ml milk and administer po for 2 days	14/68

Poaceae	Chawal	Rice	<i>Oryza sativa</i>	Winter	Seeds	Diarrhea	Boil 250 grams in 1.5 litter water then administer po twice daily	40/68
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Table 2. Important plants used in the Pothohar Plateau (district Chakwal) for the treatment of different diseases/ ailments in the ethnoveterinary medicine system.

Family	Botanical name	Vernacular name	Part used	Disease treated
Amaryllidaceae	<i>Allium cepa</i>	Piaz	Fruit	Wound and pain
	<i>Allium sativum</i>	Thom	Fruit	Mastitis
	<i>Curcuma longa</i>	Haldi	Fruit	Infectious wound, pain, and pyometra
Apiaceae	<i>Anethum graveolense</i>	Soye	Seeds	Abdominal pain
	<i>Foeniculum vulgare</i>	Saunf	Seeds	Cough
	<i>Trachyspermum ammi</i>	Ajwain	Seed	Tick infestation and mange
Asphodelaceae	<i>Aloe vera</i>	Kawar gandal	Leaves	GIT parasites
Brassicaceae	<i>Eruca sativa</i>	Tara mera	Seeds	Tick infestation, lice, and stomach pain
	<i>Lepidurum sativum</i>	Haalia	Seeds	Tick infestation
	<i>Raphanus sativus</i>	Mooli k bhej	Seeds	Redwater
Cucurbitaceae	<i>Citrullus colocynthis</i>	Kor tumma	Fruit	Allergy
Fabaceae	<i>Acacia nilotica</i>	Kikkar	Leaves	Constipation and indigestion
	<i>Quercus incana</i>	Aak	Leaves	Toxicity/ dermatitis
Lamiaceae	<i>Ocimum basilicum</i>	Niazbo	Flowers	Tick infestation
	<i>Cinnamomum camphora</i>	Mushk kafoor	Barks and stem	Myiasis
Lythraceae	<i>Punica granatum</i>	Anar	Fruit peel and seeds	Cough
Meliaceae	<i>Azadirachta indica</i>	Neem	Leaves	Stomach disorders
	<i>Eucalyptus globulus</i>	Safeeda	Leaves	Tick infestation
	<i>Syzygium cumini</i>	Jaman	Leaves	Diarrhea
Nitrariaceae	<i>Peganum harmala</i>	Harmal	Seeds	Tick infestation
Pedaliaceae	<i>Sesamum indicum</i>	Til	Seeds	Diarrhea
Pinaceae	<i>Pinus sylvestris</i>	Cheer oil	Fruit	Wound
Poaceae	<i>Oryza sativa</i>	Chawal	Seeds	Diarrhea
	<i>Sorghum bicolor</i>	Jawar	Fruit	Calcium deficiency
Rutaceae	<i>Citrus limon</i>	Leemon	Peel	Tick infestation
Salvadoraceae	<i>Salvadora oleoides</i>	Peelkan	Leaves	Colic and diarrhea
Solanaceae	<i>Capsicum annum</i>	Dara mirch	Fruit	Udder inflammation
	<i>Nicotiana tabacum</i>	Tambakoo	Leaves	Tick infestation and colic in equine
	<i>Withania coagulans</i>	Doda paneer	Flowers	Viral infection (lumpy skin disease)

Furthermore, *Syzygium cumini* was a highly preferred plant utilized to prevent diarrhea in animals and about 94.11% of local healers recommend its leaves in case of diarrhea. Figure 1 illustrates the top five medicinal plants most frequently used for infection treatment in animals, showing the importance of local flora in livestock healthcare. On the other hand, *N. tabacum* was highly preferred (80.88%), and its active compound, nicotine, has anti-parasitic properties. The summary of the top five medicinal plants used for the control of parasites in animals is graphically illustrated in Figure 2. The list of all the plants used in the ethnoveterinary medicine system in Pothohar Plateau (district Chakwal) is presented in Table 2.

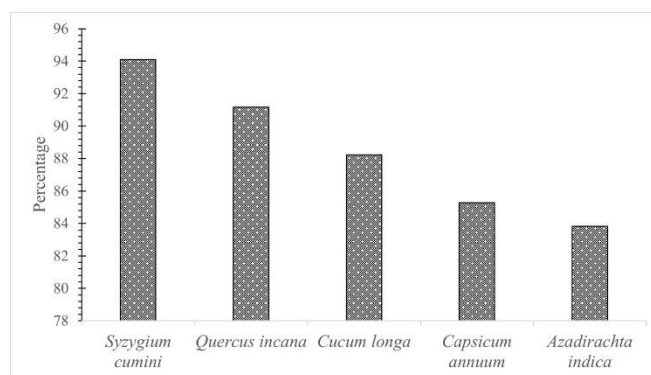


Figure 1. Top five medicinal plants preferred in district Chakwal for the treatment of infections in animals.

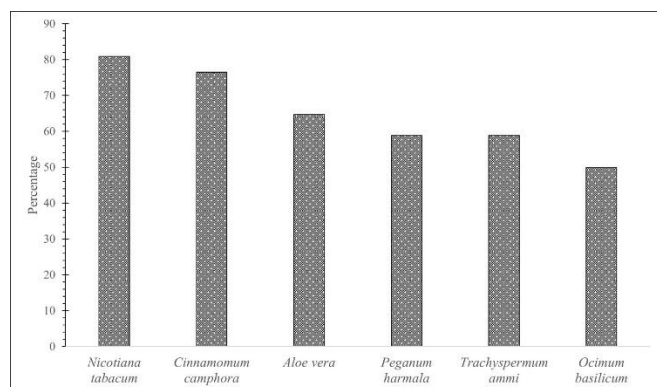


Figure 2. Top five medicinal plants used against parasites in animals in district Chakwal.

DISCUSSION

The present survey conducted in the district of Chakwal, Pakistan has provided valuable data into ethnoveterinary practices and traditional methods used by local farmers, veterinarians, and some old folk to treat different ailments of their domestic animals. The findings revealed that indigenous knowledge and practices have been passed down through generations. One of the key findings of this survey is the use of different herbal preparations or whole plant parts - leaves, seeds, bark – for treating various animal diseases. This indicates the importance of ethnoveterinary practices and the use of natural products in veterinary medicine and suggests the presence of bioactive compounds in the local flora of Chakwal that could be further studied for their medicinal properties. Another interesting aspect of the study is the use of naswar, which is available throughout the year, for the control of ticks in livestock. Furthermore, the study has highlighted the role of local healers and traditional practitioners in providing healthcare services to livestock of the district Chakwal, Punjab, Pakistan.

Many studies conducted around the world have provided insight into the use of plant parts or their herbal preparations, such as extracts, powders, or essential oils for the control of ticks, mange, and treatment of cough, diarrhea, fever, or allergy (Upirety *et al.*, 2022; Radha *et al.*, 2022; Luo *et al.*, 2022). However, in Pakistan, only a few studies were conducted that document the traditional practices of local communities and the use of medicinal plants for the treatment of ailments of animals (Abbasi *et al.*, 2013; Abidin *et al.*, 2021; Khan *et al.*, 2024). Regarding the survey on ethnoveterinary practices in Punjab which covers broad practices of local healers or some old folk against various diseases of animal or tick infestation, this is the first study conducted in this region and documented 36 herbal recipes in use. However, a potential limitation of this study is the reliance on self-reported data from a relatively small number of respondents, which may be subject to recall bias.

Additionally, the findings may not be generalizable to other regions with different plant species and veterinary practices. There are multiple routes of drug administration in ruminants such as enterally or parenterally (Lifschitz *et al.*, 2017; Turk *et al.*, 2021). The local healers prepare a mixture of herbs or recipes according to the route of drug administration, the ingredients to be used, and the purpose of the recipe. The plant parts used are dependent on the targeted ailments and type of plants (Sindhu *et al.*, 2010). In EVM, every part of the plant – root, bark, stem, seed, leaves, fruit, resin - is considered useful depending on the potential of that particular part against the diseases. In the present study, the main route of administration of the recipe was the topical application or oral administration which are the most common and convenient methods followed by the indigenous people were recorded. The method used by the local people for the measurement of dosage is approximate either via handful or bottleful depending on the severity of the condition and weight of the animals. Therefore, there is still a gap in determining the correct concentration in dosage of EVM, which is the subject of criticism by veterinarians (Abera and Mulate, 2019). In addition to this, the most commonly preferred vehicles for the administration of herbal preparations include water, oil, butter, milk, and jaggery and farmers are well familiar with the symptomatic diagnosis of the diseases of the animals.

Conclusion: The survey on EVM in, the Chakwal district of Pakistan revealed a diverse knowledge of medicinal plants used by indigenous people for the treatment of various ailments of domestic animals. The study documented a total of 31 medicinal plants belonging to 28 different families used in different preparations for the treatment of 21 common ailments of animals. The most frequently used plant parts were leaves and seeds. The present survey also provides insight into the role of local healers and some old folks in the preservation and transmission of ethnoveterinary knowledge. The current findings have important implications for the conservation of traditional knowledge of the local people of Chakwal. The documented species of plants may serve as valuable resources for further investigations regarding their efficacy, dose rate, and/or therapeutic potential or toxicological effects in animals. Future research should focus on pharmacological testing of these plants to validate their efficacy and safety, and on developing protocols for integrating ethnoveterinary practices with modern veterinary medicine.

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