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Ethno-medicinal Approach to Cure Animal Diseases

AUTHORS DETAIL

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INTRODUCTION

People have used traditional medicines, primarily those with a herbal base to treat illnesses. Finding natural remedies for early humans and animals to protect them from different poisonous diseases was quite difficult. Early animals and humans also probably eaten poisonous plants frequently in pursuit of sustenance, yet they were still able to learn about natural remedies (Yuan et al. 2016). Traditional medicine is linked to extensive indigenous knowledge in many nations that dates back to ancient times. Indigenous traditional knowledge has been used to generate a number of commonly used items, including herbal treatments for human and animal health (Farnsworth 2007). The ability of plants to treat a variety of illnesses has been established. Ethno-veterinary medicines is a term which is used to refer to traditional knowledge, beliefs, practises, and cures for numerous disorders in rural areas. Due to the discovery of certain useful ethno-veterinary products over the past ten years, these practises have grown significantly. The use of conventional treatments offers a more affordable, practical and long-lasting substitute for synthetic medications and pharmaceuticals (Dilshad et al. 2010). In some studies, roughly 30–35% of losses in the animal breeding industry occur owing to improper animal husbandry techniques particularly in developing nations, where rural residents are strongly dependent on livestock farming for their livelihood activities (Abbasi et al. 2013).

Across the world, medicinal plants (MP) are crucial for the survival of underdeveloped populations. Flowers make up most of the medicinal plants. More than 10% of the approximately 32000 species of higher plants (Prance 2021) are utilised medicinally. By 2050, it is predicted that the global market for medicinal plants would grow to $5 trillion (US). Other animals also employ plants to self-medicate; this practise is known as zoopharmacognosy and is not limited to humans. Such ethnobotanical information was gathered by research on animal behaviour, especially that of sick animals, and through interviews with indigenous groups. These indigenous people learned this information from their elders as well. Therefore, the authenticity of such knowledge may be constrained (Shinwari 2010).

Previously survey was conducted to collect the information about the people who keep the animals for business purpose or for domestic purpose. They may have some knowledge and awareness about the use of medicinal plants for the cure of the diseased animals. The percentages of the concerned people have been shared with the Table 1. According to field studies, both wild and domesticated herbs are still used in many villages, where old individuals are frequently the repository of such knowledge. These people closely guard the plant-use information that has been passed down to them through many generations. The rediscovery of such information would make it possible, for instance, to link the traditional uses of plants with the creation of novel phytopharmaceuticals in order to support regional biology and protect ethno-biodiversity (Menale and Muoio 2014).

It is known that plants can fight a variety of diseases. The livestock industry, as a subsector, accounts for roughly 56% of the value added in the agricultural sector and 11% of the GDP (GDP). The livestock subsector employs about 30 million people who reside in rural areas of the nation. Thus, methods for reducing poverty benefit significantly from cattle raising. The national herd of Pakistan consists of 53.82 million goats, 26.99 million buffalos, 1.0 million camels, and 29.6 million cattle, 26.7 million sheep, according to the Economic Survey of Pakistan report (ESP 2010). People who live in distant places use medicinal herbs to maintain the health of their cattle. It is particularly challenging for pastoralists and nomads to access veterinary care because to their traditional way of life. Collectors of herbal medicines are inexperienced, and over half of the material they gather is discarded. Finding sustainable methods to gather therapeutic plants from the wild is so necessary. This entails educating local hunters about proper hunting methods, teaching people how to grow therapeutic herbs, and getting rid of some of the intermediaries in the

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Table 1: Characteristics of Respondants by Demographics

Sr. No.	Character (Demography)	Quantity	Percentage
1	Sex		
	Male From Community	90.0	60%
	Female From Community	60.0	40%
2	Age		
	19 – 39	42	28%
	40 – 59	67	44.67%
	60 or above	41	27.33
3	Educational Status		
	Primary	66	44%
	Elementary	39	26%
	Higher Secondary	24	16%
	Graduate	21	14%
4	Occupational Status		
	Farmer	55	36.67%
	Businessman	35	23.33%
	Employee	47	31.33%
	Jobless	13	8.67

supply chain. The majority of people live below the poverty line and indiscriminately take natural resources to supplement their inadequate earnings, which is one of the main causes of the loss of biodiversity. Due to its distinctive geology, which includes the Hindu-kush Himalayas and the Karakorum, Pakistan has an altitude range of 0 to 8611 m, resulting in a variety of climatic regions and a rich floral biodiversity. More than 6,000 kinds of higher plants can be found in Pakistan. The medicinal value of the local flora is at least 12%, and numerous plants are exported. A sizable market system for crude drugs called "Pansara" is solely dependent on uncultivated plant species. Ailments in both people and animals are treated with medicinal herbs. Most of the time, some plant species are thought to be specifically effective against a certain disease, but occasionally these have dual applications (Ali and Qaiser 2009). Fig. 1 demonstrate the herbaria distribution in Pakistan.

In Pakistan the collection of dried plants is managed in different areas of the country. The largest herbaria is arranged in the Islamabad and Karachi in the territory of the university which comprises of almost 175000 dried plants while, more than 90000 dried plants are managed at the NARC Islamabad. These are managed as because of use as the medicinal purpose (Ali 2008).

Hemorrhagic Septicemia

Hemorrhagic septicaemia (HS) and mastitis are also significant problems. There is use of many locally produced combination vaccines against hemorrhagic septicemia (HS) and mastitis whose formation is plants based. Some studies have shown that certain plant extracts have antimicrobial properties and can be effective in treating HS. These plant extracts include garlic, ginger, turmeric, neem and echinacea. However, it is important to note that more research is needed to fully understand the efficacy and safety of using plant extracts to treat HS (Kuralkar and Kuralkar 2021). The bacterium *Pasteurella multocida* is a facultative anaerobic Gram-negative which was (size: 0.20-0.40 0.6-2.5 m), non-motile, non-spore-forming, capsuled short rod or coccobacillus. It has been labelled as an opportunistic pathogen that causes a number of illnesses, including enzootic pneumonia in sheep and goats, purulent rhinitis in rabbits, atrophic rhinitis in pigs, and hemorrhagic septicemia (HS) in cattle and buffaloes (Reuben et al. 2021). Fig. 2 shows the distribution of Hemorrhagic Septicemia across different regions of world, Asia and Africa.

The leaves and whole plant are the two most common plant parts used in the preparation of traditional phyto-remedies, followed by different parts of plants. Due to their ease of access and collection compared to other plant parts like the root and stem, leaves were chosen over all other plant components. Additionally, leaves serve as the primary repository for a number of secondary metabolites that are concentrated there. Due to their rich interpenes, roots were chosen after leaves (Silva et al. 2021).

Foot and Mouth Disease

This is extremely contagious and results in significant economic losses in susceptible animals with cloven hooves, such as cattle, sheep, goats, swine and many types of wildlife. The virus that causes the vesicular sores on the foot, oral mucosa and mammary glands belongs to the family Picornaviridae and genus Aphthovirus. The FMD virus (FMDV) has seven antigenic groups, or sero types: O, A, C, SAT (1 – 3) and Asia1 (Di Nardo et al. 2015). Although there is no cross-protection between serotypes, but there is a significant amount of serological cross-reaction. The genetic diversity among FMDV serotypes is evidence that various genotypic groups, or "pools," have independently evolved and circulated viral strains (Estevez et al. 2022). In both domesticated and wild ruminants, as well as pigs, it is a highly contagious viral disease that results in significant economic losses due to morbidity, mortality, and trade restrictions. Despite of the fact that the illness is widespread in Pakistan, seasonal outbreaks happen every year. Some studies have suggested that certain plant extracts may have antiviral properties and could be useful in treating FMD. For example, research found that an extract of the plant *Echinacea purpurea* reduced the viral load in cell cultures infected with FMD virus (Yasmin et al. 2020). Similarly, another study found that an extract of the plant *Andrographis paniculata* reduced the replication of FMD virus in cell cultures (Hossain et al. 2021).

There are different plants which are used for the treatment of various diseases. The specific portion of the plants are involved in the cure of the specific disease (Table 2) (Dseva et al. 2022).

Black Quarter

Black quarter (BQ) is an acute, contagious illness brought on by the gram-positive, anaerobic bacteria *Clostridium chauvoei.*

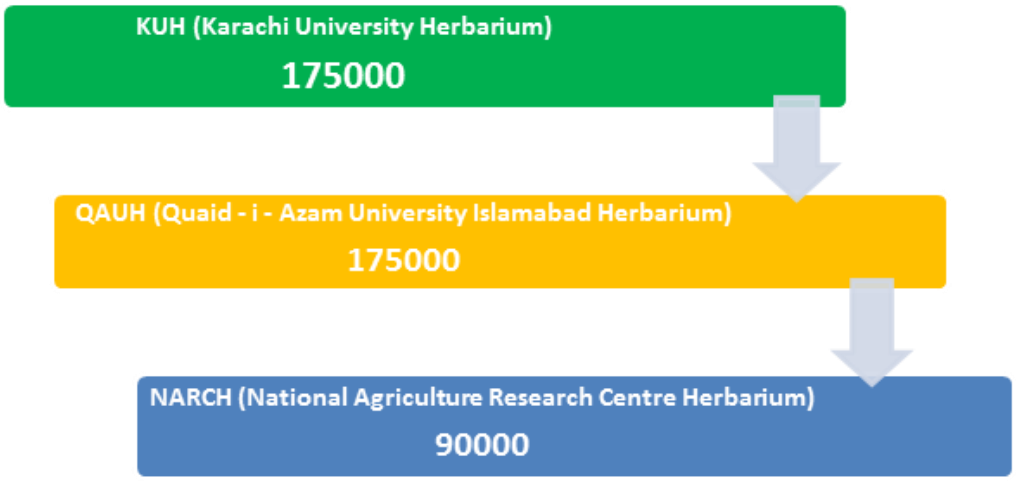

Fig. 1: Herbaria Distribution in Pakistan.

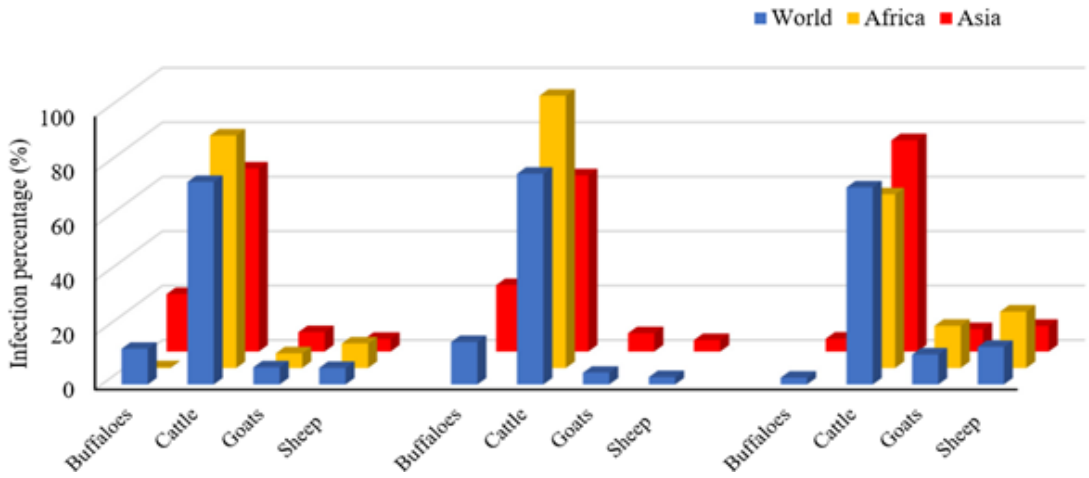

Fig. 2: Distribution of Hemorrhagic Septicemia among different animals in world, Africa and Asia

Table 2: List of Plants and their medicinal uses for different animal diseases

Sr. No.	Name of Plant	Used Portion	Advantage
1	*Abrus precatorious*	Seed	Strengthening the Placenta
2	*Caesalpinia bonnducella*	Seed	Timpani Production
3	*Calotropis gigantia*	Latex	Treatment of FMD-(foot and mouth disease)
4	*Momordica chanantia*	Leaf	FMD's Treatment
5	*Semecarpus anacardium*	Seed	FMD's Treatment
6	*Ficus racemosa*	Latex	Treatment of Bone Fracture
7	*Opuntia elatior*	Leaf	Treatment of Wound
8	*Tribulus terrestris*	Leaf	Treatment of Mouth ulcer
9	*Tamarindus indica*	Leaf and fruits	Treatment of foot disease
10	*Jatropha curcas*	Leaf and seeds	Treatment of Mouth disease, digestion

Inflammation, severe toxaemia, and gaseous oedema of the skeletal muscle are the hallmarks of this illness. Blackleg is a severe, often fatal condition that affects sheep and cattle that is also brought on by *Clostridium chauvoei*. Characteristic emphysematous swelling of the muscle lesions in cattle can appear without a prior history of wounds. As a rare form of the disease, cardiac blackleg has been observed in ruminants; nevertheless, the pathophysiology of this condition is not well known. In a study, the research on cardiac blackleg was conducted and reported two cases in 12–15-month-old Argentine feedlot steers. Over the course of 10 days, 14 out of 1,190 steers unexpectedly passed away. The animal's skeletal muscles were free of any detectable gross lesions. Two of the steers had underwent histology (Morrell et al. 2022).

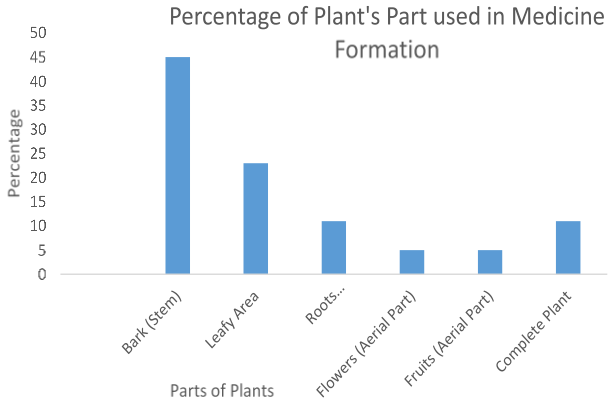

Fig. 3: Percentage of Plant's Part used in Medicine Formation.

Anthrax

Bacillus (B.) anthracis, a common zoonotic pathogen, frequently manifests as an unusual occurrence in world. Humans can become infected with anthrax through abraded skin, the respiratory tract, or the digestive tract after coming into direct or indirect contact with animals that have the disease. (Olani et al. 2020) The host becomes infected with *B. anthracis* after coming into contact with an infected animal (Savransky et al. 2020). Increased E-selectin production, which is a symptom of endothelial dysfunction, can result from excessive ROS generation (Doganay and Demiraslan 2015). The skin, lung, kidney, and liver may experience apoptosis, which is characterised by an increase in Caspase-3 and Multi Organ Dysfunction Syndrome (MODS). There was fewer animal than human reports, at a coarser spatial scale, but in places where there were clusters of human cases. Human incidence was lower when cattle vaccination rates were high (>25%), with the opposite trend occurring when vaccination rates fell. This suggests that livestock vaccination programmes reduce the prevalence of anthrax in both humans and cattle in Vietnam, however immediate improvement in livestock surveillance is required (Tan et al. 2022).

There is limited scientific research on the use of plant extracts to treat anthrax, and currently, there is no plant extract that has been proven to be effective against it. However, some plant extracts have been studied for their potential antimicrobial properties, which could potentially be useful in treating bacterial infections like anthrax (Dassanayake et al. 2021). *Aloe vera* extract has been shown to have antimicrobial properties against bacteria (Salama et al. 2022). Neem extract, which is derived from the leaves of the neem tree, has been studied for its potential use as an antiseptic and antimicrobial agent (Faujdar et al. 2020). Turmeric extract, which contains the active ingredient curcumin, has been shown to have antioxidant and anti-inflammatory properties, as well as the ability to inhibit the growth of certain bacteria (Abd El-Hack et al. 2021). Percentage of different parts of the plants which were used to produce medicines is different. Maximum medicine production occurs from the stem of the plants (Fig. 3).

Brucellosis

Brucellosis is the one of most prevalent infectious and transmissible zoonotic illnesses and has substantial morbidity and lifetime sterility rates. Intra/interspecific infection rates have dramatically increased in recent years as a result of inadequate management and scarce resources, particularly in developing nations. In cattle, poor milk production and a high body temperature are the main symptoms of abortion in the last trimester, whereas in humans, undulant fever, and arthritis are the main symptoms (Khan and Zahoor 2018). In recent years, both adults and children have used medicinal plants more frequently, to the point that 4 out of every 10 Americans now use these (Clarke et al. 2015) as an alternative therapy. Plants are used to make more than one-third of chemical medications, and there is a great deal of room for improvement in this area. A variety of ailments, including cancer, depression, bacterial diseases, rheumatic disorders, and acquired immune deficiency syndrome, are treated with medicinal plants. A native of Australia, the evergreen *Eucalyptus globulus* tree is also extensively distributed in Spain, Portugal, Italy, and India. It is used in traditional medicine to treat common infections (Asadi-Samani et al. 2016).

Mastitis

The most significant illness affecting dairy herds globally is bovine mastitis, which has a direct influence on farm profitability and food safety concerns. Antimicrobials are particularly effective in the prevention and treatment of this pathology, although the growing antimicrobial resistance of the organisms that cause this disease may reduce the effectiveness of traditional medications. Additionally, antibiotic residues in milk and the environment pose a risk to people's health. As a result, using plant extracts and essential oils as mastitis treatments for cattle may prove to be a viable option. Plant extracts and essential oils are frequently regarded as being safe for use by humans, animals, and the environment due to the well-described antimicrobial qualities that many plants possess (Lopes and Fontoura 2020).

Sunder (2013) examined the impact of *Morinda citrifolia* fruit juice on milk qualities of 13 healthy and 12 mastitis-affected dairy cows while evaluating these effects. Additionally, it was observed that consuming the fruit juice led to a significant reduction in the overall bacterial count in milk from cows infected with mastitis. The healthy animals in the treatment group showed no discernible change in these parameters. Although neither of the treatment groups' milk production levels considerably altered, the mastitis-affected animals did produce somewhat more milk after being given fruit juice.

Table 3: Different Kinds of Aflatoxins from Edible Oils

Sr. No.	Type	Melting Point	Boiling Point	Chemical Formula	Fluores cence
1	Aflatoxin-Type B_1	268.0^{0}C	528.16^{0}C	$C_{17}H_{12}O_6$	425nm
2	Aflatoxin-Type B_2	305.0 ºC	521.0^{0}C	$C_{17}H_{12}O_6$	425nm
3	Aflatoxin-Type B_3 /G_1	245.0 °C	612.1 °C	$C_{17}H_{12}O_7$	450nm
4	Aflatoxin-Type B_4/G_2	240.0 ºC	306.0^{0}C	$C_{17}H_{12}O_7$	450nm

Aflatoxicosis

Aspergillus (A.) flavus and *A. parasiticus* are the principal producers of aflatoxin, which is a form of mycotoxin. It has a significant negative impact on both human and animal health and is to blame for the loss of billions of dollars to the global economy by polluting various crops like cotton, peanuts, maize, and chilies. Aflatoxin types B1, B2, G1, and G2 are the most common and fatal of the more than eighteen distinct types that have been identified so far. Aflatoxin contamination can be controlled to a large extent by early fungal infection diagnosis. As a result, several techniques, such as chromatographic methods, molecular assays, and culture, are employed to identify aflatoxin contamination in crops and food products (Shabeer et al. 2022). The development and integrity of the plant can be harmed by *A. flavus* infection of vegetative tissues, which also offers serious dangers to the health of people and animals. As a result, methods that are secure and simple to use are used to stop *A. flavus* proliferation. In order to do this, *A. fumigatus*, a fungal endophyte, was employed as a secure biocontrol agent to inhibit the growth of *A. flavus* and its infection in maize seedlings. It's interesting to note that *A. fumigatus*, a harmless endophyte, displayed antifungal efficacy (such as 77% growth suppression) against *A. flavus*. Aflatoxin production was also decreased, particularly that of aflatoxin B1 (AFB1, 90.9%). Estimates were made of maize seedling growth, leaf and root morphology, and redox status changes at the plant level. *A. fumigatus* treatment of infected seeds markedly increased the rate of germination by almost 90% (Abdelaziz et al. 2022). Table 3 shows different kind of Aflatoxins from edible oils.

There are some aflatoxins which are naturally found in the edible oil. The major of four different kinds of these aflatoxins are present in edible oils and may also be produced naturally by many of the bacterial reactions. According to the latest classification of aflatoxigenic fungi, 18 out of the 33 species in the *Aspergillus* section Flavi produce aflatoxins naturally. The four major aflatoxin types, aflatoxins-AFB1, aflatoxins-AFB2, aflatoxins-AFG1, and aflatoxins-AFG2, can be produced by 16 of those 18 species, whereas the remaining two are synthesised from either AFB1 alone or from both AFB1 and AFB2. Most frequently polluted with AFB1, AFB2, AFG1, and AFG2 are oil seeds, particularly those from cotton, rape, sunflower, and coconut. The four main aflatoxin types identified in edible oils exhibit striking differences in their key physiochemical characteristics (Wanniarachchi et al. 2023). Nutrient infusion in utero can alter the embryo's physiological reactions. The physiological reactions of the embryo to aflatoxin B1 (AFB1) embryotoxicity can be modified by in ovo nutrition infusion (Elwan et al. 2022).

Avian influenza

Two diseases i.e., Avian-influenza and Newcastle-disease are major causes of morbidity and mortality in poultry. There are a number of reasons for this, including vaccination costs that may be unaffordable, the impossibility of storing attenuated live viral vaccines in a cold chain, and the potential ineffectiveness of commercial vaccines to defend against regionally developing strains. In comparison, vaccines made from plants are stable and safe (Nurzijah et al. 2022). The creation of transient gene expression systems in plants offers a flexible and reliable method for producing large quantities of recombinant proteins quickly and efficiently. VLPs may provide advantages such as considerable decreases in viral shedding and the capacity to distinguish between infected birds (Boskovic et al. 2015).

A key public health issue in recent years has been the animal infection with the avian influenza virus due to the possibility of a pandemic spreading throughout society. Additionally, a rise in drug-resistant influenza A virus cases has highlighted the urgent need for additional and widely accessible anti-influenza medications. It has been demonstrated for the first time that the crude ethanol and water extracts of five Asian medicinal plants, including *Andrographis paniculate, Curcuma Longa, Gynostemma pentaphyllum, Kaempferia parviflora, and Psidium guajava* have antiviral properties against H5N1 influenza virus infection in vitro and may be used as alternative antiviral compounds to treat H5N1 influenza virus infection (Chen and Guan 2015).

It is possible to produce H5N1 HA antigen in plants without modifying them genetically, as this enables quick scaling up to high-volume manufacturing. The absence of genetic modification is significant because, despite the efficient production of vaccine antigens by transgenic plants (which can take months to years, depending on the species), such methods would be impractical in emergency situations where large quantities of antigen would be needed within a few weeks of a reported outbreak. Using plant virus vectors modified to produce foreign genes is an alternate strategy. This strategy shortens development time by allowing the use of healthy, non-transgenic plants as a production system, but it depends on how well viruses replicate (Shoji et al. 2009).

Conclusion

The use of traditional medicinal practices, also known as an ethno-medicinal approach, has proven to be an effective method in treating various animal diseases. It is important to continue the research and incorporate these methods in conjunction with modern techniques to provide the best possible care for our animals. It is also very important to consider the safety and efficacy of these traditional methods before implementation. By combining the knowledge of traditional practices with modern scientific methods, we can improve the health and well-being of animals worldwide.

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