



An Overview of Ethnoveterinary Medicine in Nigeria

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ABSTRACT

A myriad of animal diseases are responsible for major losses in livestock production, threatens the epidemiology, control and prevention of zoonosis and pose a major threat to human health and as constraints to the development and enhancement of viable livestock production systems in Nigeria. The impact of these animal diseases is particularly severe in endemic and rural areas. Small-scale livestock farmers with low incomes in Nigeria have thus engaged in a long tradition of the use of herbal remedies to care for their sick and infected animals. These practices have become widespread and generally accepted because of the lack of availability of veterinary services in these rural areas and/or costs of allopathic veterinary drugs. A number of plant species have been identified by traditional herbal practitioners for treating a wide range of animal ailments. This practice also known as ethnoveterinary medicine has gone through an age long and iterative process and has been developed through trial-and-error and deliberate experimentation. However, very little information has been recorded about the plants used as veterinary medicines. Though plants serve as potent medicine for curing various diseases of human as well as animals. It is crucial to without bias learn, evaluate, promote and integrate the beneficial facets of traditional animal healthcare practices into current primary livestock health care delivery services. The specific aim of this review is to document common ethnoveterinary medicinal plants, their preparation and the application methods used traditionally to treat animal diseases.

Keywords: Medicinal plants, Ethnoveterinary medicine, Animal, Health, Diseases, Nigeria.

Introduction

Ethnoveterinary medicine is the holistic, interdisciplinary study of local knowledge and its associated skills, practices, beliefs, practitioners, and socio-cultural structures and environment associated with and pertaining to the healthcare and healthful husbandry of food, work, and other income-producing animals, always with an eye to practical development of applications within livestock production and livelihood systems, and with the ultimate goal of increasing human well-being via increased benefits from stock raising.¹ To keep animals healthy, traditional healing practices have been applied for centuries and have been passed down orally from generation to generation.^{1,2} An attempt to promote the development and conservation of ethnoveterinary medicine does not negate the value of modern veterinary medicine nor does it seek to replace it. Widespread interest in documenting and validating ethnoveterinary practices arose in the early 1980s. Since then, several studies have been carried out, many reports written, and numerous conferences and workshops held. These activities have saved ethnoveterinary knowledge from extinction because most knowledge resided with elderly community members and disappeared as they died.^{1,2} However, the effort is still quite insignificant when compared to the undocumented global ethnoveterinary plant lore.

In Nigeria, animal disease remains one of the principal causes of poor livestock performance, leading to an ever-increasing gap between the supply of and the demand for livestock products. In the absence of funds, farmers face the challenge of scarcity, erratic supply and/or high costs of synthetic drugs or veterinary services and they usually revert to more

appropriate and sustainable traditional systems of animal health care.³ Conventional veterinary services, despite its paramount role, have limited coverage in developing countries,^{4,5} as a result livestock keepers, particularly in rural areas, frequently visit traditional healers to get solutions for their sick animals; they complement modern medicine by developing a socially acceptable remedy from inexpensive resources. According to the World Health Organisation (WHO), at least 80% of people in developing countries depend largely on indigenous practices for the control and treatment of various diseases affecting both humans and animals.⁶

The traditional knowledge on ethnoveterinary practices by local healers who are knowledgeable and experienced in traditional systems of treatment is important, but their knowledge is not documented and is dwindling fast.⁷ It is also indicated that the knowledge of ethnomedicinal plants is on the verge of irreversible loss and decline because it has been transmitted across generations by oral tradition which is in danger of extinction.^{8,9} The situation is worsened by rapid socio-economic, technological and environmental changes.¹⁰ Environmental degradation, agricultural expansions, cultivation of marginal lands, and urbanization are also posing a significant threat to the future wellbeing of human and animal populations that have relied on these resources to combat various ailments for generations.¹¹ Hence, it is a timely endeavour to document, promote and conserve the country's ethnoveterinary medicinal plant lore. Such documents are important to define and maintain the cultural identity of the people.¹² In addition to serving as keys toward establishing people-centered natural resource management systems,¹³ and as a potential for scientific discovery of new compounds that could be useful in the development of modern drugs.¹⁴ Documentation of ethnoveterinary practices is critically urgent so that the knowledge can be preserved; plants conserved and sustainably managed for the control of livestock diseases. In Nigeria, management of small ruminants is largely in traditional hands.^{15, 16}

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Methodology

This study was a library/archive based systematic review. The technological tools that were available for data collection in this review included the libraries and archive access tools which were provided by data search engines: Searching Online Library Academic Resources (SOLAR) and Generic Search of Online Facilities (through Google and Google Scholar). Peer review scholarly articles with the keywords were selected and used. The single inclusion factor was the location – Nigeria. The search was limited to veterinary medicine and ethnoveterinary medicine.

Limitations of Ethno-veterinary medicine

A major challenge to ethnoveterinary medicine in Nigeria stems from the fact that traditional diagnoses may be inadequate and it has little or nothing to offer against the acute viral diseases of animals where orthodox vaccinations are effective. From a technical standpoint, some ethnoveterinary medicines are totally ineffective and cures are variable in their effectiveness according to season, the method of the preparation and method of application. Particular methods are often much localized and the scope for their further dissemination is limited. More so, cases of toxicity and underdosing are more as there is no exert dosage in relation to body weight. On the other hand, over-harvesting threatens the diversity of habitats which includes semi-arid woodland and savanna habitats. Diversity is also threatened by high deforestation rates and overexploitation.¹⁷

However, despite the limitations, the efficacy of ethnoveterinary medicine has been scientifically proven in the control of a wide spectrum of common livestock diseases such as diarrhoea, wounds, coccidiosis and reproductive disorders.^{8,18,19} In recent years a growing number of researchers from varied fields have studied, valued, confirmed, validated and documented the potential effectiveness of the traditional animal health management systems in native and local communities.¹⁷ Research has also provided an understanding of the plant chemistry and modes of action for plant species already used by many farmers. Research results have revealed several pesticide containing plants that can be used reliably and safely to treat livestock. Legal registration of these botanical products is usually not required for their promotion. This approach offers sustainable strategies directed towards developing sound and appropriate animal healthcare systems suitable and relevant to rural communities in improving livestock performance and production and, hence, livelihood.²⁰

Benefits of Ethnoveterinary Medicine

Despite these disadvantages, ethnoveterinary medicine is freely available or at a cost in proportion to the value of the animal that is beneficial. It is easily administered, usually orally or topically. It has little or no resistance effect compared to modern veterinary practices and it can be practiced almost by everyone as no western knowledge is required.

Aspects of ethnoveterinary medicine

Common methods for administering ethnoveterinary medicines include:

Drenching: This involves the oral administration of a medicine in liquid form. After measuring the medicine, it can be given to an animal using a plastic drink bottle, a bottle gourd or with a calabash spoon.^{21, 22}

Fumigation: The use of smoke or fumes to drive away or kill insects and other pests is common. Powdered material or dried leaves, dung and bark are burnt in clay pots or on the open ground.^{21, 22}

Nasal and eye drops: Liquid medicines can be applied to eyes or nostrils with a dropper, straw or folded leaf, skin application, anal application, vaginal application etc.^{21, 22}

Some ailments and common traditional Applications

1. Mastitis: Applying *Curcuma longa* (turmeric) on udder.^{23-25, 28}
2. Foot and mouth ulcers: Allowing animals to walk in hot sand and applying sand to wounds externally; applying *Linum usitatissimum* (linseed) oil and *Curcuma longa* (turmeric) externally; applying kerosene if the wounds are infested with maggots.^{23-25, 28}
3. Tympany: Drenching with *Linum usitatissimum* (linseed) oil along with a mixture of *Zingiber officinale* (ginger), *Curcuma longa* (turmeric) and *Ferula asafoetida* (devils dung); keeping the animal's mouth open by tying a piece of wood into it.^{23-25, 28}

4. Retention of Placenta: Feeding *Bambusa vulgaris* (bamboo) leaves or a mixture of oil bran *Eleusine coracana* (finger millet) grain.^{23-25, 28}
5. Diarrhoea: Drenching about 1 kg fruit pulp extract of *Aegle marmelos* (stone apple) and *Magnifera indica* (mango) seed kernel for 2-3 days.^{23-25, 28}

Reasons for ethnoveterinary medicine use included the high cost of orthodox medicines and the availability of ethnoveterinary medicines. The use of chemicals, orthodox medicines and plants that only became available in the modern era indicates the dynamic nature of ethnoveterinary medicine. The way people understand diseases is related to the way that these diseases are treated and the changes in the methods of treatment over time, therefore, suggest that disease perceptions are also dynamic. This is not surprising in the light of the cultural changes that are taking place in Africa. The indications for ethnoveterinary medicines are similar in different areas. The plant species used are, however, usually different. This indicates that locally available plant populations are a major determinant of the plant species used in ethnoveterinary medicines. Liquid dosage forms consisting of infusions and decoctions used as drenches, licks and topical dosage forms such as powders, lotions and drops are common in all studied areas. These dosage forms are easy to prepare without specialized equipment and are a reflection of the low level of technological sophistication in ethnoveterinary medicine.

Some of the medicinal plants recorded in this study have been found by earlier research to possess antimicrobial activities. *Vernonia conferta* has been used by several ethnoveterinary medical practitioners for the treatment of gastrointestinal disorders.⁴⁰ *Acacia albida*, *Piliostigma thonningii* and *Parkia biglobosa* have been reportedly used by herdsmen and traditional pastoralist in the management of animal diarrhoea.⁴¹ The potential of *Azadirachta indica* as a trypanocidal and antihelmintic agent has also been reported.^{6, 42} The root and twig of *Piliostigma thonningii* has also been used for the treatment and management of several ailments such as dysentery and severe helminths infections, fever, snake bites, hookworm and skin diseases.^{23-25, 28} The anti-inflammatory effects and prophylactic properties of the plants *Piliostigma thonningii*, *Aspilia Africana* and *Garcinia kola* are well documented.^{43, 44, 45} The hot water extract of *Ocimum gratissimum* has been shown to significantly reduce the duration of emesis comparable to metoclopramide in dogs.⁴⁶ *Gulenia senegalensis*, *Anogassus leocarpus* and *Selerocarya birrea* have been found useful in overcoming parturition difficulty in a domestic animals.⁴⁷ Ethnoveterinary medicine is developed by farmers in fields, rather than by scientists in laboratories and clinics. It is less systematic and less formalized. It is therefore, crucial to learn, evaluate, promote and integrate the beneficial facets of traditional animal health care practices into current primary livestock healthcare delivery services.

Ethnoveterinary medicine involves the use and application of medicinal herbs in treatment and management of animal diseases. However, it offers useful herbal information to animal keepers and livestock rearers. Information and knowledge drawn from traditional pastoralist who practice ethnoveterinary medicine enable livestock farmers to know and review early signs and symptoms of their sick animals. Thus, they are acquainted with the knowledge of the disease, signs and symptoms, the disease season, and the species commonly affected. Ethnoveterinary medicine also provide them with knowledge of pasture and feed selection and how to avoid vector infested pastures and contaminated watering holes. In practice, this is much wider than just the use of herbal medicines. It covers bone-repairs and setting, vaccinations (prophylaxis), treatment and management of infectious diseases, branding and identification of animals, and livestock management practices handed over traditionally. The tools and technologies range from simple tools such as thorns to vaccinate animals, to the complex animal housing adapted to local conditions. Farmers are familiar with the various materials available in their environment, and skillfully take advantage of their various qualities. Beliefs are commonly thought of as superstitious, however, some ethnoveterinary medical beliefs can be very useful because they improve the animals' condition or prevent them from getting sick. Examples are the feeding of blessed salt and forbidding animals to feed on pastures where other animals have died from diseases such as anthrax.³ These traditional beliefs have proven to be well defined disease control and prevention practices often referred to in modern-day epidemiology. Ethnoveterinary medicines are often not as fast-acting and potent as allopathic medicines. They may, therefore, be less suitable to control and treat epidemic and endemic infectious diseases such as viral enteritis, foot-and-mouth disease, rinderpest, acute haemorrhagic septicaemia, African

Table 1: Some commonly used plants in ethnoveterinary medicine in Nigeria.

Scientific Name (Common Name)	Part used	Diseases cured	Application	Reference
<i>Acacia albida</i> (Apple ring)	Leaves	Stuffy eye	Macerate in water and drench the animal.	23
<i>Acacia nilotica</i> (Locust bean)	Dried bark, fruits, and seeds	Foot and mouth disease	Infusion of pounded plant parts used to wash affected parts	23
<i>Adansonia digitate</i> (Baobab)	Fruits	Fowl cholera	Powder mixed with feed	23-25
<i>Allium sativum</i> (Garlic)	Leaves	Pasteurellosis	Decoction is given to animals	23, 25-27
<i>Allium cepa</i> (Onion)	Bulbs	Pasteurellosis, cowdriosis	Decoction is administered to affected animals	23, 24, 28
<i>Anacardium Occidentale</i> (Cashew)	Leaves, seeds	Diarrhea, infertility, arthritis, hepatitis	The powder is mixed with animal feed; Smoke repel or kill Insects	23-25
<i>Annona senegalensis</i> (Wild custard apple)	Leaves	Anti-biotics	Macerate in water and administer orally to the animal	23-25
<i>Annona senegalensis</i> (Sour sop)	Roots	Pediculosis, helminthosis, pasteurellosis, lousiness, cough, Trypanosomosis, diarrhea, dysentery	Decoction is prepared with root of <i>T. indica</i> and <i>A. senegalensis</i> and give to animals	23-25
<i>Arachis hypogea</i> (Groundnut)	Oil	Poisoning	Oil is given to the poisoned birds to drink	23-25
<i>Azadirachta indica</i> (Neem tree)	Barks	Helminthosis, dermatomycosis, poisoning, dysentery, diarrhea	Bark infusion or decoction is given	23, 29, 30
<i>Brasica juncea</i> (Mustard)	Oil	Psoroptic mange	The oil is rubbed in affected part	31, 32
<i>Cannabis indica</i> (Hemp plant)	Leaves	Newcastle disease	The leaves are soaked in drinking water	24, 33
<i>Citrus aurantifolia</i> (Lime)	Leaves	Diarrhoea	Give the liquid extract to animal orally until symptoms disappear	24, 28, 33
<i>Citrus aurantium</i> (Lemon)	Root Bark	Trypanosomosis	Mix the powder with butter and apply through the anus	24, 25, 33
<i>Curcumis sativus</i> (Cucumber)	Fruits/seeds	Anaemia, constipation	Decoction is given to lab animals to Drink	23, 25, 28, 34
<i>Desmodium velutinum</i> (Velvet leaf)	Whole of the shoot	Abortion	Decoction with potash given to animals	23-25
<i>Dioscorea dametorum</i> (Bitter yam)	Root	Blindness	Pound extract with water and drop into the eye	35
<i>Echinochloapyramidallis</i> (Antelop grass)	Whole plant	Mastitis	Decoction is used to wash the affected Udder	24, 25, 28
<i>Elaeis guinensis</i> (African Palm oil)	Fresh peels	Psoroptic mange	The oil of <i>E. guinensis</i> is rubbed followed by rubbing of fresh peels.	23, 24, 28
<i>Euphorbia poissonii</i> (Dogs thorn)	Latex	Sore, wounds	Latex is rubbed on sore, wound or any fresh cut	28, 31, 36
<i>Ficus exasperate</i> (Fig tree)	Leaves	Fever/Malnutrition	Mash leaves, mix with water, give the liquid extract to animal	35
<i>Ficus platyphylla</i> (Broad leaf fig)	Bark	Bovine contagious pleuropneumonia	Dry/pound the bark into powder and add salt, administer orally with the liquid.	35
<i>Ganoderma lucidum</i> (Ganoderma)	Fruits	Inflammation	Decoction given to animals (used mainly in cats)	28, 37
<i>Hibiscus esculentus</i> (Okra)	Stem	Placenta ejection	Pound dry stem/add water. Drench the animal with liquid.	35
<i>Khaya anthotheca</i> (White mahogany)	Stem bark	Heamaturia, dermatophilosis, babesiosis, fascioliasis, scours	The powder is mixed with feed	25, 28
<i>Mangifera indica</i> (Mango)	Leaves/ Bark Roots	Diarrhoea rinderpest, ringworm, scabies,	Grind leaves/ bark, mix with water and give animal	35
<i>Moringa oleifera</i> (Benoil tree)	Leaves, stalks	Dystocia	Decoction is given to animals during labour	23-25, 28

<i>Newbouldia laevis</i> (Boundary plant)	Leaves	Constipation	Leaves are squeezed and given to animals.	35
<i>Nicotiana tabacum</i> (Tobacco)	Leaves	Cold, pasteurellosis, ectoparasites	Mash leaves and give animal to lick.	25, 28
<i>Ocimum basilicum</i> (Sweet basil)	Leaves	Hypertension	Infusion is used	23, 24, 28
<i>Ocimum gratissimum</i> (Basil fever plant)	Leaves	Wound antiseptic	Methanolic extract applied topically	23, 24, 28
<i>Parkia biglobosa</i> (Locust bean)	Seeds	Foot pain	Use grinded seeds to rub affected part till symptoms disappear.	35
<i>Phaseolus vulgaris</i> (Common bean)	Leaves	Milk ejection	Pound and add water. Drench the animal with the liquid.	35
<i>Piliostigma thonningii</i> (Monkey bread)	Twig, Root	Muscular weakness, Ringworms, scours, fascioliasis	Tie the twig to the affected joints of animal for few days to recover. Administer Decoction to animals	23-25, 28
<i>Psidum guajava</i> (Guava)	Leaves	Trypanomosis Helminthosis, scours, diarrhea, cough, dysentery	Decoction with salt is given to animals leaf infusion is given	23-25
<i>Solanum spp</i> (Garden egg)	Leaves	Trypanosomosis	The powdered is mixed with drinking water and given to animals	23-25, 28
<i>Spondias mombin</i> (Hog plum)	Leaves	Retained placenta/ mastitis	Dry the seeds and mix with water, then administer orally.	35
<i>Talinum triangulare</i> (Water leaf)	Leaves	Promotes growth	Feed	25, 28
<i>Tapinanthus dodoneifolius</i> (Goat weed)	Leaves	Salmonellosis caused by <i>S. pullorum</i> and <i>S. gallinarum</i>	Infusion or decoction is given to birds	25, 28, 36
<i>Telfaria occidentalis</i> (Fluted pumpkin)	Fruits	Bacterial, viral and fungal infections	Decoction powder is administered	31, 38
<i>Tephrosia vogelii</i> (Fish bean)	Leaves	Tick	Pound leaves, soak with wood ash in water, stir, filter and add animal urine. Bathe animal with solution.	31, 35, 38
<i>Tridax procumbens</i> (Tridax)	Leaves	Promotes growth	Feed supplement	24, 25, 28
<i>Vernonia amygdalina</i> (Bitter leaf)	Leaves	Helminthosis, bacterial infection	The powder mix with salt and infusion is given	23, 39
<i>Vernonia conferta</i> (Bitter leaf)	Leaves	Diarrhoea	Macerate in water and administer orally.	25, 28
<i>Zea mays</i> (Maize)	Grain	Diarrhoea	Roast and feed to animal.	23, 28, 31, 38

swine fever, anthrax, rabies, Newcastle disease and acute life-threatening bacterial infections. For these problems, allopathic veterinary drugs might be the best option for effective control and management.

Conclusion and Recommendations

The use of certain medicinal plants can be shown to be rational in terms of the known biological effects of the plants involved. The chain of transfer of ethnoveterinary knowledge from generation to generation may, therefore, be broken if not documented properly. Considering urbanization and mass migration of young people and the lack of properly documented and written records of ethnoveterinary medicines, this knowledge may as well go extinct. Most young people seek employment opportunities in urban areas, where ethnoveterinary knowledge is of little practical value while others see it as superstition and myths. This endangers the knowledge of ethnoveterinary medicines while it is still freely available. Research should be developed on ethnoveterinary plants to ensure long-term benefits for livestock keepers from ethnobotany and traditional medicine in Nigeria. Comparative studies should be carried out in various regions of the country to provide a comprehensive database on ethnoveterinary medicinal plants and ethnoveterinary practices. The pharmacological actions of ethnoveterinary medicines should be studied and properly documented. The feasibility of promoting safe and effective herbal medicines should be investigated. Aspects of standardization and quality control should be considered. Cultivation, local self-sufficiency, sustainability, distribution and conservation of medicinal plants should

be considered and encouraged. Viable alternatives to orthodox medicines that will reduce total expenditure on animal health should be promoted. Where applicable, intellectual property rights must be respected by researchers and developers. Conventional allopathic veterinary service alone cannot fully address all the challenges and complexities of health problems of the modern period.

Conflict of interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

References

1. Toyang NJ, Nuwanyakpa M, Ndi C, Django S, Kinyu WC. Ethnoveterinary medicine practices in northwest province of Cameroon. *Indigenous Knowledge and Development Monitor*. Nuffic – CIRAN, The Hague, Netherland. 1995; 1:3-19.
2. Phondani PC, Maikhuri RK, Kala CP. Ethnoveterinary Uses of Medicinal Plants Among Traditional Herbal Healers in Alaknanda Catchment of Uttarakhand, India *Afr J Trad Comp Med*. 2010; 7:195–206.

3. Mathias E and McCorkle CM. Traditional Livestock healers. *Rev Sci Tech.* 2004; 23:277-284.
4. Girish, HV and Satish S. Antibacterial activity of important medicinal plants on human pathogenic bacteria - a comparative analysis. *World Appl Sci J.* 2008; 5:267-271.
5. Sathiyaraj K, Sivaraj A, Madhumitha G, Kumar PV, Saral A, Devi K, Antifertility effect of aqueous leaf extract of *Aegle marmelos* on male albino rats in: *Int J Curr Pharm Res.* 2010; 1:26-29.
6. Jabbar A, Raza MA, Iqbal Z, Khan MN. An inventory of the ethnobotanicals used as anthelmintics in the southern Punjab (Pakistan). *J Ethnopharmacol.* 2006; 108:152-154.
7. Yineger H, Kelbessa E, Bekele T, Lulekal E. Ethnoveterinary medicinal plants at Bale Mountains National Park, Ethiopia. *J Ethnopharmacol.* 2007; 112:55-70.
8. Matekaire T and Bwakura TM. Ethnoveterinary Medicine: A Potential Alternative to Orthodox Animal Health Delivery in Zimbabwe. *J Appl Res Vet Med.* 2004; 2:269-273.
9. Mesfin F, Demissew S, Teklehaymanot T An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia *J Ethnobiol Ethnomed.* 2009, 5:28.
10. Sarasan V, Kite GC, Sileshi GW, Stevenson PC. The application of phytochemistry and in vitro tools to the sustainable utilisation of medicinal and pesticidal plants for income generation and poverty alleviation. *Plant Cell Rep.* 2011; 30:1163-1172.
11. Teklehaymanot T, Giday M, Medhin G, Mekonnen, Y. Knowledge and use of medicinal plants by people around Debre Libanos monastery in Ethiopia. *J Ethnopharmacol.* 2007; 111:271-283.
12. Cetinkaya G. Challenges for the maintenance of traditional knowledge in the satoyama and satoumi ecosystems, Noto Peninsula, Japan. *Hum Ecol Rev.* 2009; 16:27-40.
13. Lynam T, De Jong W, Sheil D, Kusumanto T, Evans K. A review of tools for incorporating community knowledge, preferences, and values into decision making in natural resources management. *Ecol and Soc.* 2007; 12:5.
14. Cos P, Vlietinck A, Vanden Bergh D, Maes L. Anti-infective potential of natural products: How to develop a stronger in Vitro 'proof- of- concept'. *J Ethnopharmacol.* 2006; 106:290-302.
15. Ihemelandu EC, Nduaka O, Ojukwu EM. Hyperimmune serum in the control of Peste des petits ruminants. *Trop Anim Health Prod.* 1985; 17: 83-88.
16. Ajala AA. Women's tasks in the management of goats in Southern Nigeria. *Small Rum Res.* 1995; 15:203-208.
17. Wazala W, Zessin KH, Kyule NM, Baumann MPO, Mathias E, Hassanali A. Ethnoveterinary medicine: a critical review of its evolution, perception, understanding and the way forward. *Livest Res Rural Dev.* 2005; 17:11-27
18. Mlambo T, Mbiriri DT, Mutibvu T, Kashangura MT. Village chicken production systems in Zhombe communal area of Zimbabwe. *Livest Res Rural Dev.* 2011; 23:154-170.
19. Mwale M, Bhebhe E, Chimonyo M, Halimani TE. Use of herbal plants in poultry health management in the Mushagashe small-scale commercial farming area in Zimbabwe. *Int J Appl Res Vet Med.* 2005; 3:163-170.
20. Stevenson PC, Nyirenda SP, Veitch NC. Highly glycosylated flavonoids from the pods of *Bobgunnia madagascariensis*. *Tetrahedron Lett.* 2010; 51:4727-4730.
21. Balakrishnan VM. Ethno veterinary Studies among Farmers in Dindigul District. *Global J Pharmacol.* 2009; 3:15-23.
22. Najma DJ, Abiy YZ, Ermias AV, Beatrice TO, Ramni JL. Traditional Ethnoveterinary medicine in East Africa: a manual on the use of medicinal plants. The World Agro forestry Centre (ICRAF), Nairobi, Kenya. 2015. 88-218p.
23. Marandure T. Concepts and key issues of ethnoveterinary medicine in Africa: A review of its application in Zimbabwe. *Afr J Agric Res* 2016; 11:1836-1841.
24. Mann A, Gbate M, Nda Umar A. Medicinal and economic plants of nupeland. Jube Evans Books and publication, Bida, Nigeria. 2003; 3-276p.
25. Sofowora A. Medicinal plants and traditional medicine in Africa. John Willey and Sons, New York; 1993.
26. Saganuwan SA. A photo album of some medicinal plants of the Nigerian middle belt. *J Herb Spice Med Plants.* 2010; 16:219-292.
27. Mann A, Abalaka ME, Garba SA. Antimicrobial activity of the leaf extract of *Calotropis procera*. *Biochem Lett.* 1997; 55:205-210.
28. Iwu MM. Handbook of African medicinal plants. CRC press, Boca Ragin, Fl. 1993; 435p.
29. Sharma LD, Bahga HS, Soni BK. Anthelmintic screening of three indigenous medicinal Plants against *Ascaridia galli* in poultry. *Indian Vet J.* 1967; 44:665-669.
30. Adamu M, Naidoo V, Eloff JN. The antibacterial activity, antioxidant activity and selectivity index of leaf extracts of thirteen South African tree species used in ethnoveterinary medicine have excellent antifungal activities. *BMC Comp Alt Med.* 2012; 12:213-225.
31. Dalziel JK. Local treatment of ear mite infestation in a colony of rabbits in the mild hills of Western Nepal. *Vet Rev Kath.* 1996; 11:30-45.
32. Mann A, Ibrahim K, Oyewale AO, Amupitan JO, Fatope MO, Okogun JI. Isolation and elucidation of three triterpenoids and its antimycobacterial activity of *Terminalia avicennioides*. *Am J Org Chem.* 2012; 2:14-20.
33. Saganuwan SA. Some medicinal plants of Arabian Peninsula. *J Med Plant Res.* 2010; 4(9):766-788.
34. Saganuwan AS. Tropical plants with antihypertensive, antiasthmatic and antidiabetic value. *J Herb Spices Med Plants.* 2009; 15:24-44.
35. Ademola IO, Fagbemi BO, Idowu SO. Anthelmintic activity of extract of *Spondias mombin* against gastrointestinal nematodes of sheep; studies in vitro and in vivo. *Tropical Ani Health Pro.* 2005; 37: 223 - 235.
36. Gbile ZO. Ethnobotany taxonomy and conservation of medicinal plants. In: Sofowora A. ed. *The State of Medicinal Plants Research in Nigeria.* U.I press, Nigeria; 1986.
37. Cox PA and Balick MJ. The ethnobotanical approach to drug discovery. *Sci Am.* 1994; 271:82-87.
38. Fatope MO, Takeda Y, Yamashita M, Okabe H, Yamauchi T. New Cucurbitane triterpenoids from *Momordica charantia*. *J Nat Prod.* 1990; 53:1491-1492.
39. Saganuwan AS and Gulumbe ML. Screening of *Vernonia amygdalina* for in-vitro antimicrobial activities and phytochemical constituents. *J Med Pharm Sci.* 2007; 3:32-43.
40. Iqbal Z, Jabbar A, Akhtar MS, Muhammad G, Lateef M. Possible Role of Ethnoveterinary Medicine in Poverty Reduction in Pakistan: Use of Botanical Anthelmintics as an Example. *J Agric Soc Sci.* 2005; 2:187-195.
41. Offiah NV, Dawurung CJ, Oladipo OO, Makoshi MS, Makama S, Elisha IL, Gotep GJ, Samuel AL, Shamaki D. Survey of herbal remedies used by Fulani herdsmen in the management of animal diarrhoea in Plateau State, Nigeria. *J Med Plants Res.* 2012; 6:4625-4632.
42. Nok AJ, Esievo KAN, Longdet I, Arowosafe S, Onyenekwe PC, Gimba CE, Kagbu JA. Trypanocidal Potentials of *Azadirachta indica*: In Vivo Activity of Leaf Extract against *Trypanosoma brucei*, Gun. *Biochem Nutr.* 1993; 15:113-118.
43. Fakaeb BB, Cambell AM, Barrett J, Scott IM, Teesdale-Spittle PH, Liebau E, Brophy PM, Inhibition of glutathione S-transferase (GSTs) from parasitic nematodes by extracts from traditional Nigerian medicinal plants. *Phytother. Res.* 2000; 14:630-634.
44. Igoli JO, Ogali OG, Tor-Anjiin TA, Logli NP. Traditional medicine practice amongst the Igede people of Nigeria, Part II, *Afr J Trad Compl Alt Med.* 2005; 2:134-152.
45. Chah JM, Igbokwe EM and Chah KF. Ethnoveterinary Medicine used in small ruminant health in the Eastern Guinea Savanna of Nigeria. *Livest Res Rur Dev.* 2009; 21: 79-85.
46. Udem SC and Opara IC. In Book of Proceedings of the 38th Annual Congress of the Nigerian Veterinary Medical Association held on 9-13th October 2001 in Topo Badagry, Lagos State, Nigeria.
47. Hassan WA and Zalla II. Overcoming parturition difficulties in domestic animals through ethnoveterinary practices in Zamfara State. Proceedings of the Eighth Annual Conference of Animal Science of Nigeria. 16-18th September 2005 at the University of Technology Minna, Nigeria.