

Ethno-veterinary medicine used in small ruminant health in the Eastern Guinea Savanna, Nigeria

J M Chah, E M Igbokwe* and K F Chah

Faculty of Veterinary Medicine, University of Nigeria, Nsukka

* Department of Agricultural Extension, Faculty of Agriculture, University of Nigeria, Nsukka

jmchah@yahoo.co.uk

Abstract

A survey of household heads engaged in small ruminant production was conducted in Benue North and Nsukka Agricultural Zones of Benue and Enugu States respectively, to document indigenous knowledge of plants used for small ruminant health management. A total of 100 smallholder farmers were interviewed on the status of animal health care delivery in the area. Information on common livestock ailments that had been treated by traditional means and the medicinal plants used, their preparation, application and expected results were obtained.

About 75.0% of the farmers owned 6-10 animals most of which were confined in wooden/thatch pens. Male heads and male members of each household were responsible for disease management in the study area. A field manual of traditional veterinary treatments of 17 diseases in small ruminants was compiled. A total of 12 plant species were identified for the treatment of the diseases. Other traditional/indigenous methods employed in the treatment of small ruminant diseases included: kerosene plus oil and oil plus salt to mention but only two. Some herbs had multiple medicinal uses while others were effective as mixtures. Different herbal treatments/indigenous methods were often cited for the same disease, with varying dosages and methods of administration.

Standardization and validation of traditional knowledge is necessary to fully integrate ethnoveterinary medicine into orthodox veterinary medicine. It is also recommended that male members of the household should be targeted for any extension programme aimed at improving small ruminant health. Also scientific investigation should be made to ascertain the effectiveness of plants identified and indigenous methods in the treatment of small ruminant diseases.

Key words: indigenous methods, Nigeria, small ruminant diseases

Introduction

Small ruminants (sheep and goats) are important domestic animals in tropical livestock systems. They enjoy a wider distribution and greater flock dynamism than other livestock species within Africa. In Nigeria, they are embedded in the social and ceremonial life to an extent unequalled by other animal species (FDLPCS 1992). The ownership of these small ruminants is regarded as an investment. These animals constitute a major source of animal protein in Nigeria; for example goat meat being estimated to account for about 20% of all meat consumed in the country (Brimkmann and Adu 1977).

In Nigeria, management of small ruminants is largely in traditional hands (Nduaka and Ihemelandu 1973; Ajala 1995). In the southern guinea savanna region of Nigeria like in many parts of the country, small ruminant production and productivity is impeded by various constraints which include health. This constraint can adequately be alleviated or curtailed by modern or western-style technologies such as vaccination, chemoprophylaxis/chemotherapy, feeding animals with formulated rations and proper housing. Small ruminants in the study area are largely in the hands of rural farmers. Since these farmers are mostly located in the rural areas, they are scarcely aware of veterinary and improved management services. In some cases, many of those who are aware of the services cannot afford to pay for them because they are expensive.

However, the rural small ruminant farmers have developed indigenous methods or technologies for coping with the constraints. Among the various indigenous methods is the use of herbs to manage animal diseases. The knowledge base of these herbs differs not only from region to region but also within communities. It has been developed through trial and error and deliberate experimentation. Therefore, it is less systematic, less formalized, and not universally recognized as a valid method of disease control in animals (Matekaire and Bwakura 2004).

In many countries, there has been little documentation of traditional knowledge; rather, it has been transmitted across generations by an oral tradition and therefore is in danger of extinction (Matekaire and Bwakura 2004). While small ruminant farmers have less to offer in the treatment and control of some diseases e.g. acute life threatening bacterial diseases, they can cope with a reasonable spectrum of common disease conditions such as diarrhea, wounds, colds, worms, and reproductive disorders etc (Matekaire and Bwakura, 2004). Small ruminant owners have an excellent knowledge of ethnobotany, which has formed the basis for screening plant materials as potential sources of medicinal drugs (Spore 1992). The herders of the Turkana and Samburu communities in Kenya identified about 60 diseases of livestock and grouped them as treatable and non-treatable using local remedies.

Approximately 35 of these diseases were treatable, including streptothricosis, mange, cough, and diarrhoea (Wanyama 1997). Scientific research and experiments by farmers in Trinidad and Tobago found that adding preparations from plants such as *Mormodica charanta* to drinking water improves the productivity and profitability of broilers. Paw-paw latex (*Cicaria papaya*) has been used successfully as an anthelmintic drug in goats (Satrija et al 1995).

Reliance on plants and plant products as remedies of disease dates back to antiquity. Medicinal plants constitute a complete spectrum of consumable plants which are purely dietary; example includes fresh vegetables and fruits which provide essential vitamins (Benowica 1979) and those known to be purely medicinal. Much has been documented on the use of plants/plant products in human medicine (ethno medicine). In the face of rising cost of western-style (modern) medicine and increased concern about development of drug resistant parasites and tissue residues of chemotherapeutic agents, the sustainability of many of these modern technologies in livestock production is seriously called to question. A search for alternative methods of livestock production is therefore, of utmost necessity. It is therefore, worthwhile to provide information on plants and plant products used for ruminant health in the southern guinea savanna region of Nigeria. Therefore the study sought to: (i) identify plants and plants products used for ethnoveterinary medicine; (ii) ascertain the seasonal availability of identified plants; and (iii) analyze gender roles within households in the collection and utilization of plants used for small ruminant health and to draw policy implications.

Methodology

Two states (Benue and Enugu) were purposely selected for the study on the basis of their being contiguous. From each of the states an agricultural zone (Nsukka, Enugu State and Benue North, Benue State) was randomly selected. From the selected agricultural zones, five extension blocks were selected at random and from each block, one extension circle was randomly selected. Using the Agricultural Development programme (ADP) listing of households, 10 households were selected from each circle giving a total sample size of 100 households. Structured interview schedule was administered to the one hundred household heads. In addition, household heads and other knowledgeable family members were selected and focus group discussions (FGD) held by gender and age segregated groups in order to validate the responses from the interview. Information on plants/and other traditional methods used for animal health and seasonal availability were sought from respondents. Also common small ruminant ailments the farmers had encountered and diagnosed, ailments they had treated by traditional means, and medicinal materials used, their preparation, and application were sought. Representative samples of all useful plants, (leaves, roots, and bark of the medicinal plant) were collected and identified by a plant taxonomist in the Department of Botany, University of Nigeria, Nsukka. The study was dominantly descriptive using percentages; however a correlation analysis was carried out to determine the significance of the relationship between stock size and material goods own.

Results and discussion

Stock data

Herd size

The number of animals owned ranged from 1-35. As shown in Table 1, about 24.0% of the respondents owned 1-5 animals while 30.5% kept 6-10 animals. About forty five percent of the respondents owned more than 10 animals; this percentage was contributed mainly by respondents from Benue State (more than 50.0% of the respondents kept 10 animals or more.). The small herd sizes might be attributable to poor management practices (North 1972).

A correlation was sought between stock size and material goods owned. There was no significant relationship ($r=0.053$; $p < 0.05$) between stock size and material goods owned by the respondents. However, when the comparison was made on the basis of state, a significant relationship was observed with respect to respondents in Benue State ($r=0.67$; $p \leq 0.05$). Generally, rural people keep small ruminants as a source of security and income during emergencies (Tangka et al 2000). Therefore, it is not surprising that wealthier farmers may not keep a large number of small ruminants. However, in some rural communities farmers keep large stock for prestige purposes (Ekong 1988). The implication is that livestock extension agents must avoid the "tarmac bias" characteristic of extension services in developing countries but must seek out all categories of farmers including the very poor that use livestock mainly as financial security.

Type of animal house

About 57.9% of the animal pens were of mud + thatch. Another 27.4% were constructed from vegetation + thatch. Some of respondents indicated that houses with zinc/metal roofs were usually very hot especially during the dry season and so affected the health of their animals.

Table 1. Percentage distribution of stock data

Stock data	Enugu (n=45)	Benue (n=50)	Total (n=95)
<i>Herd size</i>			
1-5	51.1	0.0	25.6
6-10	42.2	20.0	31.1
11-15	6.7	34.0	20.4
16-20	0.0	18.0	9.0
21-25	0.0	16.0	8.0
26-30	0.0	6.0	3.0
31-35	0.0	6.0	3.0

Type of animal house

Mud + iron sheet	6.7	2.0	4.4
Block + iron sheet	15.6	0.0	7.8
Block + thatch	0.0	2.0	1.0
Mud + thatch	15.7	96.0	55.8
Vegetation + Thatch	57.7	0.0	29.9
Vegetation + iron sheet	4.4	0.0	2.2

Gender distribution of disease management

Entries in Table 2 show that male members of households including children were the principal household members responsible for disease management. This implies that males in the area were the major custodians of indigenous knowledge on disease management in small ruminants. Awa (1989) indicated that herding and care of livestock is almost exclusively the domain of men. Also Grandin et al (1991) indicated that Maasai men perform minor veterinary procedures and castration and buy and administer veterinary drugs. Davis (1995) found that no difference existed between male and female Afghan nomadic pastoralists with regards to ethnoveterinary knowledge. Males in the eastern guinea savannah should therefore be the target group for any further studies on ethnoveterinary knowledge related to small ruminants.

Table 2. Gender distribution of disease management tasks in small ruminant production

Activity	Enugu (n=45)	Benue (n=50)	Total (n=95)
Disease management			
Male head only	51.1	2.0	26.1
Male head and male children	11.1	72.0	41.6
Housewife and all children	6.7	6.0	6.4
Housewives	22.2	0.0	11.1
Male children	8.9	20.0	14.5
Female children	0.0	0.0	0.0
Housewives and female children	0.0	0.0	0.0
Everybody in the house	0.0	0.0	0.0

Measures adopted to prevent/eliminate incidence of disease

Entries in Table 3 show that 56.9% of farmers relied on vaccination of their animals to prevent/avoid diseases. However, only 17.8% of the respondents in Enugu State applied this measure. About 39.5% of the farmers sought veterinary advice; other measures included confinement (12.1%) and feeding animals well (6.7%). It was observed that up to 32.1% of the respondents used no preventive measures in their farms. A majority (62.2%) of the respondents who did not use any preventive measure were from Enugu. Prevention of small ruminant diseases is the key to successful production. Farmers especially those in Enugu State should be encouraged to adopt several measures for preventing diseases. Generally, from the table it could be concluded that most small ruminant farmers in the eastern guinea savannah are conscious of the harmful effects of disease agents and therefore undertake management practices that will prevent infection in their farms.

Table 3. Percentage distribution of measures adopted to prevent/eliminate disease incidence

Measure	Enugu (n=)	Benue (n=45)	Total (n=95)
Vaccination	17.8	96.0	56.9
Keep animals off from rain	11.1	0	5.6
Confinement	22.2	2.0	12.1
Cleaning the pen when animals are sick	6.7	0	3.4
Frequent cleaning of pen	8.9	0	4.5
Use mixed drugs from chemist	4.4	0	2.2
Feeding animals well	13.3	0	6.7
Avoiding wet grasses	8.9	0	4.5
Seeking veterinary advice	8.9	70.0	39.5
No preventive measure adopted	62.2	4.0	32.1

Small ruminant diseases/pests, symptoms and season most prevalent in the Eastern Guinea Savanna

About 20 disease conditions were identified by the respondents in the study area (Table 4). Of the 20 disease conditions, diarrhea and cough were most prevalent. Diarrhea, cough and nasal/ocular discharges have been reported to be the major symptoms of pestes des petits ruminants (PPR). Oboegbulem and Chah (1997) recorded PPR as the major disease of small ruminants in southeastern Nigeria.

As can be observed from Table 4, cough and diarrhea (which are major clinical signs of PPR) were reported to occur mostly in the wet season. This observation agrees with the findings of Oboegbulem and Chah (1997) who

reported that although PPR occurs throughout the year more cases were seen during the rainy season or during the first half of the year. Veterinary/ livestock extension workers should therefore educate farmers on the predisposing factors of this disease and ways of preventing it since it can cause serious economic losses. Cold and dampness are some of the predisposing factors. Farmers should be advised to raise the floors and or use dry grass or wood shavings as beddings so as to prevent dampness and provide warmth for the animals especially at night. Other disease conditions identified were *ngbujiri*, *iheomumal*, *osseisa*, *jajagaja*, retained placenta, mastitis, *oda nua ewu*, conjunctivitis and trypanosomosis. Extension workers should therefore inform farmers of the season of highest susceptibility of small ruminants to the diseases so as to take precautions to avoid infections.

Entries in Table 4 also show that mange, scabies, fleas, and ticks were the pests identified in the study area. However, mange appeared to pose more problems. Although there was a low mortality rate in animals attacked by mange, the morbidity was always high, with a resultant poor performance. Livestock extension workers should educate small ruminant farmers on the importance of calling in a veterinary personnel to properly teach them ways of preventing this disease or encourage them of any traditional practices use to prevent it.

Table 4. Small ruminant diseases/pest, symptoms and seasonal prevalence

Disease/pest	Symptoms	Seasonal occurrence
<i>Ngbujiri</i>	Lameness	AYR
<i>Iheomuma</i>	diarrhea, nasal discharges	AYR
<i>Osseisa</i> (diarrhea)	Mouth, nose and eye discharges, raised coat and swollen head, cough and watery faeces	WS
Conjunctivitis	Stuffy eyes	DS
Foot rot	Lameness	AYR
Cough	Mouth, nose and eye discharges, cough and watery faeces	WS
<i>Jajagaja</i>	Dizziness	AYR
Retained placenta	After birth retained	AYR
Mastitis	Pain on the breast	AYR
<i>Oda nua ewu</i>	Watery faeces, body swells	WS
<i>Ekpukpa</i> (scabies, mange)	Unsteadiness, rubbing body on concrete walls, bruises on the skin, loss of hair and scaly body, dusty ears	AYR
Trypanosomiasis	Unsteadiness, blindness	WS
Venereal disease	Blisters on the vulva	AYR
Botulism	Twisting of neck	AYR
Fleas	Loss of hairs and scaly body, lice on the body	WS
Ticks	Lice on the body	WS
Mites	Seen moving on the skin	DS
Ringworm	Scaly body	AYR
Wounds	Broken skin	AYR

AYR- All year round, WS - Wet season, DS- Dry season

Plant species used in the treatment/management of diseases

Table 5 presents the list of plant species and other traditional methods used in the treatment/management of diseases of small ruminants in the eastern guinea savanna. About 12 plants were identified by respondents for the treatment of small ruminant diseases/pests. Other traditional/indigenous methods employed include: kerosine plus oil, oil plus salt etc (Table 5).

Table 5. List of plant species and other traditional methods used in the treatment/management of diseases of small ruminants in the eastern guinea savanna

Local name of plant	Common name of plant and traditional method	Botanical name	Enugu	Benue
<i>Agba tree</i>		<i>Daniellia oliveri</i>	y	X
<i>Anyanchu</i>		<i>Glyphea brevis</i>	y	X
<i>Ebario cha</i>	Fibre grass	<i>Waltheria indica</i>	y	X
<i>Echikara</i>		<i>Spondias monbin</i>	y	X
<i>Osha ma</i>		<i>Dalbergia</i>	y	X
<i>Oze</i>		<i>Landolphia spp</i>	y	X
<i>Udure</i>		<i>Napoleona vulgellii</i>	y	X
<i>Unugbu</i>	Bitter leave	<i>Venonia conferta</i>	y	Y
<i>Zalcami</i>	Poisonous garden egg	<i>Solanum spp</i>	y	Y
<i>Iwa era</i>	Forest bitter yam	<i>Dioscorea dametorum</i>	y	X
	Guava leaves	<i>Psidium guajava</i>	y	X

	Hot oil*	y	X	
	Palm/salt*	y	X	
	Raw pap in water*	y	X	
	Engine oil*	y	X	
	Salt/water*	y	X	
	Salt/kerozine*	y	X	
	Sulfur cake*	y	X	
	Palm oil	y	Y	
<i>Oguru</i>	Dregs of palm oil*	y	X	
	Maize/cassava flour*	y	X	
	Roasted maize*	y	X	
	Palm Oil/gunpowder*	y	Y	
	Cassava flour	<i>Manihot esculenta/utilissima</i>	x	X
	kerosine*	y	Y	
	Gammalin*	y	Y	
	Hand picking*	x	Y	

y = obtainable, x = not obtainable, *= other traditional/indigenous methods used

Method of preparation of plant species used for the treatment/management of specified small ruminant diseases/pests

It was evident that various plants are extensively used in different herbal preparations administered to animals. It was also observed that various plant parts – the bark, roots, leaves, and seeds were widely in use as remedies for a variety of disease conditions in the traditional setting for small ruminants (Table 6). Information resulting from phytochemical research efforts in biological and pharmaceutical as well as physical sciences reveals that most of these plants used in local medicine contain some physiologically active compounds, which are known to be potent medicines (Iwu 1993).

It could be noted from the results that, although some of the plants were disease specific, for example *Vernonia conferta* used for diarrhea, *Glyhea brevis* used for retained placenta, others appeared to provide multipurpose remedies, preventing or curing several kinds of ailments. For example *Dioscorea dumetorum* was used for treating diarrhea and blindness while *Spondias monbin* was used for treating retained placenta and mastitis. This suggests that the plants with multipurpose uses may contain more than one type of physiologically active principles.

It was also observed that different parts of the same plant and different components of the same plant part might be use for different purposes. For instance, the leaves of *Solanum spp* were reportedly used to treat diarrhea while the fruit was used to dress wounds. This supports the findings of Dean (1996) who reported that villagers in the Pare Mountains of Tanzania used the juice of *Solanum incanum* berries to treat wounds, ringworm and fevers in ruminants. The plant has proved effective against both gram-positive and gram-negative bacteria *in vitro* (Chah et al 2000). Also water extracted from the roots of *Dioscorea dumetorum* is use as antidiarrhoic and at the same time used to treat blindness.

Table 6. Method of preparations of plant species used for the treatment/management of specified small ruminant diseases/pests

Disease/pest	Plant used	Part (s) used	Methods (s) of preparation
Diarrhoea	1) <i>Vernonia conferta</i>	Leaves	Squeeze in water and use to drench the animal
	2) <i>Manihot esculenta</i>	Roots	Soaked cassava in water and use the water to drench the animal
	3) <i>Dioscorea dametorum</i>	Root	Pound and extract water, mix with cassava and maize powder to form a paste and give the animals to eat
	4) <i>Landolphia spp</i>	Leaves	Feed leaves to the animals
	5) <i>Daniellia oliveri</i>	Bark	Roast, grind and mix with oil to a paste, feed the animal
	6) <i>Zea mays</i>	Grains	Roast and feed the animal
	7) <i>Leucaena spp</i>	Leaves	Macerate in water and drench the animal
	8) <i>Solanum spp</i>	Leaves	Macerate in water and drench the animal
Retained placenta	1) <i>Glyphea brevis</i>	Leaves	Macerate in oil and massage the stomach
	2) <i>Spondias monbin</i>	Leaves	Macerate in water and drench the animal
Mastitis	<i>Spondias monbin</i>	Leaves	Drench and also use the leaves to massage the udder
<i>Theomuma</i>	<i>Waltheria indica</i>	Leaves	Macerate in water and drench
Stuffy eye	<i>Dalbergia spp</i>	Leaves	Macerate in water and drench
Blindness	<i>Dioscorea dametorum</i>	Root	Pound extract with water and drop in to the eye
Strong abdomen	<i>Bobomishe</i>	Concoctions	
Venereal disease	<i>Palm oil</i>		

<i>Oda nwa ewa</i>	<i>Udure</i>	Leaves	Feed animals with leaves
Mange/scabies	1) Palm oil/salt		Apply mixture on affected area
	2) Engine oil		Apply the oil on affected area
	3) Sulphur cake		Grind and dust on the animal
	4) Palm oil		Apply the oil on affected area
	5) Dregs of palm oil		Apply dregs on affected area
	Processing		
	6) Palm oil/gun powder		Apply mixture on affected area
	7) Kerosine		Apply on affected area
	8) Gammalin		Apply on affected area
	9) Hot oil/limestone		Apply on affected area
Fleas	1) <i>Vernonia conferta</i>	Leaves	Squeeze in water and bath the animal
	2) Palm oil		Apply all over the body
Ticks	Hand picking		Pick ticks from the body
Mites	Palm oil		Apply all over the body
Ringworm	<i>Vernonia conferta</i>	Leaves	Massage the site with the leaves
Wounds	<i>Solanum spp</i>	Fruit	Pound and extract with water, use it to dress the wound

Some of the medicinal plants recorded in this study have been found to contain antimicrobial activities. For example *Solanum spp* used in the treatment of diarrhoea (Chah et al 2000) and also *Vernonia conferta* for the treatment of gastrointestinal disorders (Iwu 1993). *Spondias monbin* appears to have good medicinal properties because all the respondents who indicated that they use the plant strongly stated that it is very effective. *Spondias monbin* has been reported to have good ecobolic properties (Iwu 1993). This explains why leave extracts of the plants are traditionally used in management of retained placenta and mastitis.

Many plants have been implicated for the treatment of diarrhoea. Extension workers should encourage farmers to utilize bitter leaves in the treatment of diarrhoea, and other diarrhoea related ailments such as PPR. Interestingly, apart from plants, rural household farmers also use traditional/indigenous methods to treat some ailments especially those caused by pests. For instance, mange being the most serious pest is treated with palm oil/salt, dregs of palm oil, and palm oil amongst others. This finding supports the work of Onwubuya and Chah (1999) who reported the use of yellow stone (sulphur cake), Izal, engine/palm oil and kerosine in the treatment of mange in rabbits.

Some of these plants are commonly found around homes for example; *Solanum spp* (in Benue State) and *Vernonia conferta* (in both states). Extension workers should encourage farmers to cultivate them in their farms due to their antimicrobial properties. Also demonstration farms and gardens should be set up, to educate farmers and also to prevent some of these plants from going extinct. *Solanum spp* is available mostly in the wet season. Farmers should again be taught ways of preserving this plant to make it available all year round.

Ethnoveterinary medicines/modern veterinary services

All the farmers interviewed used plants or traditional methods to treat small ruminant diseases. During Focus Group Discussions (FGDs), farmers stated that, they use these plants because they are readily available and at low or no cost at all. Mathias (1986) outlined some of the advantages of ethnoveterinary medicine; they are cheaper than comparable western drugs, locally available and easily accessible, and culturally appropriate and therefore readily understood. Also in a study carried out by Padmakumar (1998) in Kerala (South India), majority of farmers indicated that, they used traditional medicine because it had no side effects. Wilkinson (1984) reported that any modern drug used in veterinary medicine has side effects; most of which are minor and usually go unnoticed but some drugs may inadvertently terminate a pregnancy, while others may cross the placental barrier and produce abnormalities in the foetus. Prolong administration of drugs like chloramphenicol, penicillin and ampicillin can cause skin eruptions in animals (Wilkinson 1984). However, it is not clear why traditional drugs produce no side effects. In Indian indigenous system of medicine (Ayurvedism) it is believed that traditional drugs do not produce side effect due to their holistic properties, which in some cases can be used to counteract the side effects of modern drugs (Majumdar 1989). The low cost and availability of the ingredients encourage farmers to try ethnomedicine first.

There is reason therefore to believe that in spite of a wide network of modern veterinary services farmers in the eastern guinea savanna still have recourse to ethnoveterinary medicines for their animals. As noted by Padmkumar (1998), the rediscovery of traditional knowledge and ancient practices, and a suitable blending of these with western therapies may ultimately promote the emancipation of the local farmers. This observation also holds true for small ruminants farmers in Nigeria.

Conclusions

- Although indigenous knowledge is gaining ground in most parts of the world, people still consider it inferior to western style-knowledge.
- To arrest this problem policies aimed at educating farmers on the value of indigenous knowledge should be formulated and extended to the curricula of universities and secondary schools.
- Extension should also convince local health officials of the value of a greater knowledge of nature as well as the socio-cultural context of plants and their ascribed medicinal and other effects.

- Extension agents should work hand in hand with veterinarians on the possibility to blend both the orthodox drugs with traditional treatment, which will go along way to improve animal health care in rural areas.

References

Ajala A A 1995 Women's tasks in the management of goats in Southern Nigeria. *Small Ruminant Research* 15:203-208.

Awa N E 1989 Underutilization of women's indigenous knowledge in agriculture and land rural development programmes: The effect of stereotypes, In: D.M. Systems: Implication for Agriculture and International Development. Ames (Iowa): Studies in Technology and Social Change 11: 3-9

Benowica R T 1979 Vitamins and You. New York: Gosset and Dunlap.

Brinkmann W L and Adu I F 1977 The problems of goat production in savannah region of Nigeria. NAPRI (National Animal Production Research Institute). Amadu Bello University, Zaria, Nigeria.

Chah K F, Muko K N and Oboegbulem S I 2000 Antimicrobial activity of methanolic extract of Solanum torvum fruit. *Fitoterapia* 71: 187-189

Davis D K 1995 Gender-based differences in the ethnoveterinary knowledge of Afghan nomadic pastoralists. *Indigenous Knowledge and Development Monitor* 3 (1): 3-4 <http://www.iss.nl/ikdm/IKDM/IKDM/3-1/articles/davis.html>

Dean A R 1996 Traditional and re-applied veterinary medicine in East Africa. In: C.M. McCorkle, E. Mathias and T.W. Schillhorn Van Veen (editors). *Ethnoveterinary Research and Development*. London: Intermediate Technology Publications 256-264

Ekong E E 1988 Rural Sociology. Ibadan: Jumak Publishers.

FDLPCS 1992 Nigeria Livestock Resources. Volume 2: National Synthesis. Federal Department of Livestock and Pest Control Services, Abuja, Nigeria.

Grandin B E, De Leeuw P N and De Souza M 1991 Labour and livestock management. In: Solomon Bekure, de Leeuw P N, Grandin B E and Neate P J H (editors). *Maasai Herding: An Analysis of the Livestock Production System of Maasai Pastoralists in Eastern Kajiado District, Kenya*. ILCA System Study 4. ILCA (International Livestock Centre for Africa), Addis Ababa. Ethiopia pp. 71-82 <http://www.fao.org/wairdocs/ILRI/x5552E/x5552e08.htm>

Iwu M M 1993 Handbook of African Medicinal Plants. C.R.C. Press Boca Taton, Ann Arbor Tokyo London.

Majumdar A K 1989 Ayurveda and modern medicine. *Ancient Scientific Life*, 8: 117-190

Matekaire T and Bwakura T M 2004 Ethnoveterinary medicine: A potential alternative to orthodox animal health delivery in Zimbabwe. *International Journal Applied Research in Veterinary Medicine* 2 (4) 269-273 <http://jarvm.com/articles/Vol2Iss4/MatekaireIJARVMVol2No4.pdf>

Mathias E 1986 How can ethnoveterinary medicine be used in field projects? *Indigenous Knowledge and Development Monitor* 4(2) 6-7

Mathias E, McCorkle C M and Schillhorn Van Veen T W 1996 Introduction. *Ethnoveterinary Research and Development*. Intermediate Technology Publications, London: 1-24.

Nduaka O and Ihemelandu E C 1973 Observations on pneumonia-enteritis complex in dwarf goat, in Eastern States of Nigeria: Preliminary report. *Bulletin of Epizootic Diseases of Africa* 21:10-22

North M O 1972 Commercial Chicken Production Manual. The Avi publishing Company, Inc. Westport Connecticut.

Oboegbulem S I and Chah K F 1997 Retrospective studies of diseases of goats in Nsukka, Eastern Nigeria. *Bulletin of Animal Health and Production in Africa* 45: 235-240

Onwubuya E A and Chah Jane M 1999 A rabbit management profile in Nsukka agricultural zone: Implications for agricultural extension in Nigeria. *Nigerian Journal of Agriculture and Teacher Education* VII (1&2): 73-80

Padmakumar V 1998 Farmers' reliance on ethnoveterinary practices to cope with common cattle ailments. *Indigenous Knowledge and Development Monitor* 6 (2): 14-15 <http://www.iss.nl/ikdm/IKDM/IKDM/6-2/padmakum.html>

Satrija F, Nansen P, Murtini S and HE S I 1995 Anthelmintic activity of Papaya latex against patent Heligmosomoides polygyrus infections in mice. *Journal of Ethnopharmacology* 48: 161-164

Spore 1992 Medicine from the forest (editorial) 37:5 <http://collections.infocollections.org/ukedu/uk/d/Jcta37e/3.html>

Tangka F K, Jabbar M A and Shapiro B I 2000 Gender roles and child nutrition in livestock production systems in developing countries: A critical review. *Socio-economics Policy Research*. Working paper 27. ILRI (International Livestock Research Institute). Nairobi Kenya 64 pp. <http://www.smallstock.info/reference/ILRI/Workp27/Toc.htm>

Wanyama J 1997 Ethnoveterinary knowledge among pastoralists of Samburu, Kenya. *Journal of Ethnopharmacology* 38: 105-112

Wilkinson G T 1984 'Adverse effects of drugs', *Current Therapeutics: Journal of Clinical Pharmacology and Therapeutics* 25: 47-60

Received 4 October 2009; Accepted 19 October 2009; Published 3 December 2009

[Go to top](#)