

**COURSE CODE: VMD 809**

**COURSE TITLE: ADVANCED RUMINANT MEDICINE**

**HELMINTHOSIS IS A MAJOR CONSTRAINT TO LIVESTOCK PRODUCTION  
IN NIGERIA. DISCUSS ITS CONTROL HIGHLIGHTING FACTORS  
MILITATING AGAINST ITS CONTROL ESPECIALLY IN NORTHERN  
NIGERIA.**

**PWAVENO H. BAMAIYI**

**(PGA/06/07663)**

**COURSE LECTURER: PROF M. M. ALIYU**

**DEPARTMENT OF VETERINARY MEDICINE**

**FACULTY OF VETERINARY MEDICINE**

**UNIVERSITY OF MAIDUGURI**

**BORNO STATE**

**NIGERIA**

# INTRODUCTION

Helminthosis has long been recognized as a major constraint to the productivity of ruminants and other livestock in Nigeria and elsewhere, and has been the cause of serious economic losses (Akerejola et al, 1979; Okun et al, 1980). For example in Nigeria the economic loss due to Helminthosis in small ruminants alone has been estimated to be at least 144 million naira annually, through death, weight loss and liver condemnation (Akerejola et al, 1979). In addition more than 800 million people in the world are affected by helminthiasis (Stoll, 1947). Helminths are more widespread in tropical regions due to climatic and sociological factors (Cavier, 1973).

The major control measure against helminthoses in Nigeria is chemotherapy. However, the availability of drugs varies (Okun et al, 1980). Different Anthelmintics both broad spectrum and narrow spectrum are usually used parenterally or orally to treat livestock against helminthes and also for prophylaxis. Some of these drugs include ivermectin, albendazoles, praziquantel, pyrantel, niclosamide, levamisole hydrochloride, piperazine, e.t.c. These drugs are usually administered at the beginning of the rainy season, the middle and end of the rainy season where they are available though the schedule of administration varies from place to place and farmer to farmer (Blood et.al, 1994).

The significance of helminthoses has been recognized by local people and herdsmen from the earliest times who have made various attempts at control through the use of medicinal plants. Fulani herdsmen in Nigeria recognize animal helminthiasis to be a problem of greatest significance in calves of less than a year old and routine herbal treatment is started within 1 week of birth (Ibrahim et al, 1983a).

Only a few of the plants used traditionally as anthelmintics in Africa have previously been studied. *Hunteria umbellata* (*Polyadoa umbellata*), which has been used as an anthelmintic for humans in Nigeria, was shown to have the same anti-ascarid potency as pure piperazine base by Onuaguluchi (1964). The plants *Combretum mucronatum* and *Mitragyna stipulosa*, used for the treatment of guinea-worm in African traditional medicine, were found to be effective against helminthiasis and their use has been recommended, as has that of a combination of *Elaeophorbium drupifera* and *Hillaria latifolia* (Ampofo, 1978).

A number of plants, either those used in African traditional medicine as anthelmintics or species closely related to them, have been tested elsewhere and some have been found to be useful. Raw garlic (*Allium sativum*), used in Nigeria as a vermifuge (Dalziel, 1937), was shown to have some activity against *Ascaridia galli* in chicken (Das and Thakuria, 1977) and to inhibit the embryonation of the eggs of *Necator americanus* and *Ancylostoma caninum* (Bastidas, 1970). The juice of *Citrus aurantifolia* is used as a vermifuge in Senegal and Sierra Leone and as a treatment for dysentery in West Africa (Dalziel, 1937). A number of *Citrus* species such as *C. decumara*, *C. acida*, *C. aromaticum* and *C. medica* have been found to be active against *Ascaris lumbricoides* (Kaleysa, 1975).

*Diospyros mespiliformis* is used in Nigeria as a veterinary vermifuge and as a remedy for dysentery in humans (Dalziel, 1937). Diospyrol, from the related plant *D. mollis*, was shown to be superior to bephinium against *Necator americanus* in hamsters and against *Hymenolepis nana* in mice (Sen et al, 1975). Decoctions of the berries of *D. mollis* have been used in antihookworm campaigns in Thailand (Sadavongvivad, 1980). Similarly several *Cucurbita* species, such as *C. maxima*, *C. moschata* and *C. aromatica*, have been shown to be taeniocidal in mice (Albert et al, 1972), in rats (Srivastava and Singh, 1967) and in man (Lozoya, 1978; Plotnikov et al, 1973).

Some of the plants used as traditional anthelmintics in Africa have been studied and the chemical basis of their action outlined. The alkaloids pelletierine and isopelletierine are responsible for the taeniocidal action of *Punica granatum* (Oliver, 1960). The main taeniocidal components of the female flowers of *Hagenia abyssinica*, used in Ethiopian traditional medicine, are Phloroglucinol derivatives ( $\alpha$ -kosin,  $\beta$ -kosin, protokosin and kosotoxin) (de Carneri and Vita, 1973).

There are also some plants common in Nigeria whose use as anthelmintics elsewhere has been confirmed experimentally. Such plants include *Tribulus terrestris* whose anti-ascarid use in India was confirmed against *Ascaridia galli* (Chakraborty et al, 1979), as well as *Anacardium occidentale*, the oil of which is active against *Ascaridia galli* in chicken (Varghese et al, 1971) and against hookworms in dogs and man (Cavier, 1973).

## **SOME INDIGENOUS METHODS OF DISEASE CONTROL IN NORTHERN NIGERIA**

Livestock production is a source of employment and livelihood in Nigerian agriculture. A large percentage of the rural people of this country satisfy their subsistence needs through livestock production. It involves the rearing and marketing of livestock. This class of animals includes cattle, sheep, goats, pigs, poultry, camels etc.

Cattle are the most prominent of all domesticated animals in Nigeria (Tewe 1997). There are many breeds of cattle indigenous to Nigeria. Some of these are *Red Bororo*, *White Fulani*, *Sokoto Gudali*, *Muturu*, *Keteku* and *Ndama*. In Nigeria, mobile pastoralism or transhumance is the dominant system and it involves movement of the herdsmen, their families, and the herds from place to place, with the availability of fodder, water and animal health as determining factors. Cattle are kept as status symbol, beef production, hides and skin, milk production as well as for traction power on the farm.

Helminthosis is one of the greatest threats to the realization of the productive potential of our cattle herds in Nigeria. The inadequacy of modern health delivery system in our cattle production enterprises either in human or material resources calls for a look at the alternative means of dealing with the menace of Helminthosis and other diseases. Pests and diseases control is also carried out according to the traditional beliefs of the herdsmen before and even after the advent of scientific control methods.

The indigenous knowledge of livestock owners forms the foundation for and complements the success of all sustainable animal health care programs in developing countries. It is only recently that orthodox veterinarians and other scientists have begun to recognize the fact that livestock owners have holistic understanding and approach in dealing with disease and other problems than livestock production.

Orthodox animal health care in Nigeria is plagued by many problems. These include inadequate manpower and logistics inputs, scarce and erratic supply of veterinary drugs and supplies, high cost of veterinary drugs, poor communication facilities and other modern amenities, counter-productive government policies which do not complement the development of ethnoveterinary medicine and other indigenous systems. The relation between these problems and the current dependence on orthodox veterinary medicine has resulted in a failure to solve the majority of animal health problems.

Walter and Dietrich (1992) reported that traditional medicine still plays an important role in the nomadic life. It has been practiced since time immemorial because it was the only medical system accessible to the majority living in the remote areas. According to them traditional healers know a lot about the transmission and spreading of diseases. Therefore diseases prevention plays an important role, for instance traditional tick control. They reported the following:

- Nomads used to avoid places with high infestation of ticks.
- Animals were fed with plants containing a high level of salt, thus the ticks fall off.
- Before leaving the enclosure in the morning, women and children collect ticks from the animals and throw these ticks into a fire burning near the entrance to the enclosure
- Shady trees were avoided in case of ticks infestation
- Tick eradication by burning the infested pasture was widely used.

Padmakumar (1998) pointed out that there are two main systems or methods of treating diseases viz

- Magic-Religious healing, mostly done by reading the Koran

- Practical treatment including herbalism i.e. treatment with parts of plants or other natural products.

Under the practical treatment, the most common treatment is the scarification and blood letting in order to free the animal from spoiled blood and using red-hot plates on animal body to burn disease spot. Indication of this type of therapy are lameness, the rheumatic complex, skin diseases and infections diseases of the alimentary and respiratory tract.

Also, Rajan and Sethuraman (1997) reported that indigenous disease control measures are carried out through herd management viz:

- Herd dispersion is used to reduce the risk of infecting all animals belonging to one household.
- Choosing animal for breeding was based on the health of the animal
- Prevention of contact between healthy and ill animals
- Diseases prevention can cause herdsman and his herds to move.
- Pastoralist avoids regions where insect or cattle rearers use medication without proper care and therefore complications arise.
- There may also be over-dosage, false applications and wrong treatment.

### ***Indigenous control methods of pests and diseases of cattle***

In a research conducted by Adekunle *et.al.*(2002) in Kano, Niger and Kogi states various indigenous methods used by respondents to control pests and diseases of cattle in their herds are presented in Table 1.

### **Hygiene**

About 93 percent of respondents practiced this control method; this involves keeping the environment clean, setting fire to warm the environment at cold nights. This according to them prevents contagious *Bovine pleuropneumonia* .

### **Herbs**

This is practiced by about 87 percent of respondents and involves cutting herbs and boiling them for their animals to drink. In Kano the most common herb boiled for drinking is locally called “*Duma rafi*” *Ipomoea isarifolia* or *ipomoea repens*. It was also reported in Niger state to cure malaria in cattle.

In Niger and Kogi states the most common herb used was locally known as “*Taura*” *Delarium senegalense* boiled for the animals to drink for curing Diarrhoea in cattle.

### **Self diagnosis**

This control method was practiced by about 90 percent of the respondents. Here the respondents relied on experience gained over time to arrive at the type of ailment. This is common with tick infestation, diarrhoea, helminthiasis and malaria. The symptoms include loss in weight, body temperature, frequent defecation.

### **Movement**

Seventy-three percent of respondents practice this type of indigenous control method. It involves leaving an area for another when they notice the presence of pests or diseases especially in a case of sudden death of cattle.

## Bush burning

The respondents believed burning surrounding bush would reduce the menace of tick infestation by burning of the eggs of the tick, as well as the elimination of possible intermediate host for pests and diseases.

## Spiritual incantations

The herdsmen use spiritual incantations when an unexplainable death occurs in their herd. Though only about 28 respondents accept practicing this control method this may be due to secrecy surrounding spiritualism.

## Use of holy books

Thirty-five percent of the respondent indicated the use of holy books in controlling diseases and pest. According to them, this involves the reading of verses from the holy Koran over the animals before leaving the enclosure. Sometimes these verses are even written and rapped up into an amulets to be worn by the animals.

## Herd sharing

This involves the distribution of cattle among relatives and grown up children in other location apart from the area of infestation during emergency disease and pest invasion in order to lessens rate of casualties. This method was practiced by 22 percent of respondents.

**Table 1.** Frequency distribution according to indigenous methods of control of pests and diseases of cattle (n = 77)

Indigenous control methods	Frequency of use	Percentage
Hygiene	72	93.5
Herbs ( <i>Ipomoea isarifolia</i> , <i>ipomoea ripens</i> )	67	87
Self diagnosis	70	90.1
Movement	56	72.7
Bush burning	37	48.1
Incantation (spiritual)	22	28.6
Use of Holy books	27	35
Herd sharing	17	22
Breeding	40	52
Use of local Concoctions	27	35

Source: Field Survey, 1995.

## Effectiveness of these indigenous control methods

The respondents rating of the effectiveness of the various indigenous control methods of pests and diseases is presented in Table 2. From the survey, the effectiveness of these control methods of pests and diseases depends on the type of pests and diseases concerned and the complexity of the attack. According to Table 2, indigenous control methods using hygiene, herd sharing, breeding and herbs are effective in controlling the effects of pests and diseases of cattle.

**Table 2.** Frequency distribution according to the respondents ranking of the effectiveness of indigenous control methods.

Control methods	Not effective (n)	Percent	Effective (n)	Percent	Very effective (n)	Percent
Hygiene (n = 72)	15	21.0	40	55.5	17	23.5
Herbs (n = 67)	14	21	34	51	19	28
Self Diagnosis (n = 70)	27	38.6	32	45.7	11	15.7
Movement (n = 56)	17	30.4	21	37.5	18	32.1
Bush burning (n = 37)	22	59.4	10	27	5	13.5
Spiritual incantation (n =22)	2	9.1	15	68.2	5	2.7
Use of holy books (n = 27)	2	7.4	18	66.6	7	31.8
Herd sharing (n = n)	--	--	15	88.2	2	11.7
Breeding (n = 40)	6	15.0	32	80.0	2	5.0
Use of local concoction (n=27)	11	40.7	16	59.2	-	-

Source: Field Survey, 1995.

## FACTORS MILITATING AGAINST CONTROL OF HELMINTHOSIS

Many factors have militated against successful helminth control in Nigeria especially in the northern part of the country and these include:

1. **Poor Funding of anthelmintic campaigns:** Strategic use of anthelmintics is designed to reduce worm burdens and contamination of pasture by helminth eggs. Strategic control with anthelmintic is based on knowledge of seasonal changes and epidemiology of the infection. For example in Nigeria, treatment against *Haemonchus contortus* occur in June and July, because heamonchosis incidence rises from May to October and reaches its peak in September (Fabiya, 1973; Okon and Enyenihi, 1975). To adequately carry out these strategic and tactical deworming program adequate funds should be provided by relevant government authorities. But these funds are not forth coming and hence farmers are left at the mercies of their pockets to get their animals dewormed.
2. **Illiteracy:** The problem of illiteracy has contended against the successful control of Helminthosis especially in the northern part of Nigeria. Most farmers cannot read or write and have little or no information on orthodox means of controlling Helminthosis hence resort to other means of improving the productivity of their animals including superstition (Adekunle *et.al*, 2002). This lack or inadequate education also makes these farmers to stop experts from handling their animals.
3. **Poverty:** The level of poverty in the country among farmers who keep these animals is alarmingly high and hence is a major drawback to their ability to employ the services of veterinarians in controlling Helminthosis. Also, the high cost of modern anthelmintics has limited the effective control of these parasites.
4. **Inadequate extension services:** Since the illiteracy level is high among animal farmers there is a greater need for extension workers and services but these are in short supply. Many farmers come across such workers only when there is a major epidemic that the government is trying to contain or the government is launching a vaccination campaign but few get to hear about control of Helminthosis from these workers who themselves are poorly informed or lack dedication and commitment to their work.

5. **Inaccessible location of farmers:** Many livestock farmers live in remote rural areas with either no accessible roads or very rough roads that take only the determined to reach there. Since the government has not provided adequate transport logistics to reach all these areas it becomes difficult for veterinary personnel to get across to them.
6. **Attitude of workers:** The extension workers and unfortunately some veterinary personnel do not only lack dedication and commitment to their work but are driven by pecuniary avarice and greed to exploit these already impoverished livestock farmers for their selfish gains. Such attitudes also discourage farmers from employing the services of experts in curtailing disease.
7. **Nomadic nature of farmers:** Livestock farmers especially the cattle rearers such as the Fulanis are nomadic by nature moving over long distances in search of pasture and water and sometimes running away from suspected disease infested locations. In the process of doing this they introduce more helminth infections in their new locations or aggravate the already existing infections.
8. **The activities of quacks:** The activities of quacks have continued to be a major impediment not only Helminthosis but the control of disease generally in this country. These quacks are unqualified individuals who take the advantage of the ignorance of farmers to administer wrong therapy to their animals. This has continued to hinder the successful control of disease
9. **Sub standard drugs and indiscriminate use of drugs:** Our markets are flooded with all manner of substandard, fake and expired drugs which are used by farmers or unscrupulous elements (quacks) to control helminth infections leading to the problem of development of resistance to certain drugs due to underdosage or use of expired drugs. Currently many anthelmintics are present in the market whose potencies and efficacies have not been independently proven by any research but yet are being marketed for helminth control leading to failures in helminth control. In some cases widespread intensive use of sometimes low quality anthelmintics (MONTEIRO et. al., 1997) has led to development of resistance and hence a reduction in the usefulness of available anthelmintics (WALLER, 1997).
10. **Indiscriminate grazing:** since farmers cannot afford to keep their animals intensively or give them adequate and balanced nutrition the animals are usually left to graze indiscriminately on infected pastures containing larvae or other developmental stages of these helminth parasites.
11. **Deworming programs:** The lack of proper organization and implementation of deworming programs and availability of viable and efficacious anthelmintics has also plagued the livestock industry in the country.

## REFERENCES

- Adekunle, O.A., Oladele, O.I. and Olukaiyeja, T.D. (2002) <http://www.cipav.org.co/lrrd/lrrd14/2/adek142.htm>  
Livestock Research for Rural Development 14 (2) 2002
- Adewunmi C O and Sofowora E A. 1980. Preliminary screening of some plant extracts for molluscicidal activity. *Planta Med.* 39: 57–65.
- Akerejola T W, Schillhorn van Veen and Njoku C O. 1979. Ovine and caprine diseases in Nigeria. *Bull. Anim. Hlth. Afr.* 27: 65–70.
- Albert O, Djetcha T, Lagrange E, Aourousoau M, Forgacs P, Provost J and Tiberghien R. 1972. Experimental study of the anthelmintic activity of several cucurbitacines. *Helminthol. Abstr.* 41(2): 311.
- Ampofo O. 1978. Plants that heal. *Helminthol. Abstr.* 47(6): 247.
- Bastidas G J. 1970. Effect of ingested garlic on *Necator americanus* and *Ancylostoma caninum*. *Helminthol. Abstr.* 39(3): 349.
- Blood DC, Radostits OM, Henderson JA, eds.: 1994, Veterinary Medicine, 8th ed., Bailliere Tindall, London, England
- Brander G C and Pugh D M. 1977. *Veterinary applied pharmacology and therapeutics*. 3rd edition: Bailliere Tindall, London. 536 pp.
- Cavier R. 1973. Chemotherapy of intestinal nematodes. In: *Chemotherapy of helminthiasis*. Vol. 1. Pergamon Press, Oxford. pp. 215–436.
- Chakraborty B, Ray N M and Sikdar S. 1979. Study of anthelmintic property of *Tribulus terrestris* Linn. *Indian J. Anim. Health* XVIII(1): 23–25.
- Dalziel J M. 1937. *The useful plants of West tropical Africa*. Crown Agents, London. 612 pp.
- Das P N and Thakuria B N. 1977. Anthelmintic effect of garlic (*Allium sativum*) against *Ascaridia galli*. *Helminthol. Abstr.* 46(11): 1058.
- de Carneri I and Vita G. 1973. Drugs used in cestode diseases. In: *Chemotherapy of helminthiasis*. Vol. 1. Pergamon Press, Oxford. pp. 145–213.
- Fabiyi, J.P. Seasonal fluctuations of nematode infestations in goats in the savanna belt of Nigeria. *Bull. Epizoot. Dis. Afri.* 21:227-286 (1973).
- FAO 1996** Food for all. Report of the World Food Summit 13th -17th November. FAO, Rome
- Field survey 1995** Report of the Survey on the Indigenous methods of control of pests and diseases of cattle in Kogi, Kano, and Niger states of Nigeria.
- Githens T S. 1948. *Drug plants of Africa*. University of Pennsylvania Press.
- Gordon H M. 1955. Anthelmintic effects of piperazin on helminths of sheep. *Austr. Vet. J.* 31: 52.

Gordon H M. 1957. Studies on anthelmintics for sheep. *Austr. Vet. J.* 33: 1–7.

Ibrahim M A, Nwude N, Aliu Y O and Ogunsusi R A. 1983a. Traditional concepts of disease and treatment among Fulani herdsman in the Kaduna State of Nigeria. ODI Pastoral Network Paper 6C, July 1983.

Ibrahim M A, Nwude N, Ogunsusi R A and Aliu Y O. 1983b. Present study.

Kaleysa R R. 1975. Screening of indigenous plants for anthelmintic action against *Ascaris lumbricoides*. Part II. *Indian J. Physiol. Pharmacol.* 19(1):47–49.

Lely H V. 1925. *The useful trees of northern Nigeria*. Crown Agents, London.

Lozoya X. 1978. Balance between man and Nature. *Helminthol. Abstr.* 47(5): 1058.

Mahmood I, Masood A and Saxena S K. 1982. Effect of some plant extracts on the mortality of *Meloidogyne incognita* and *Rotylenchulus reniformis*. *Abstr. Trop. Agric.* 8(5): 59.

MONTEIRO, A. M., S. W. WANYANGU, D. P. KARIUKI, R. BRAIN, F. JACKSON, Q. R. MCKELLAR (1997): Pharmaceutical quality of anthelmintics sold in Kenya. *Vet. Rec.* 142,396-398.

**Nigerian Social and Economic Research 1981** Food Balance sheet for Ministry of National Planning for feedback provision on piggery technology.

Nwude N. 1977. Nigerian plants that may cause poisoning in livestock. *Vet. Bull.* 47(11): 811–817.

Nwude N and Ibrahim M A. 1980. Plants used in traditional veterinary medical practice in Nigeria. *J. Vet. Pharmacol. Therap.* 3: 261–273.

Okon, E.D., Enyenihi U.K. Incidence of *Haemonchus contortus*, *Gaigeria pachyllis* and *Oesophagostomum columbimum* in goats in Nigeria. *Bull. Anim. Hith. Prod. Afri.* 23:145-153 (1975).

Okun E D, Ogunsusi R A and Fabiyi J P. 1980. Survey and feasibility studies on fascioliasis and parasitic gastro-enteritis of ruminants in Nigeria. Federal Livestock Department of Nigeria Report.

Oliver B. 1960. *Medicinal plants in Nigeria*. Private edtn. Nigerian College of Arts, Science and Technology, Ibadan.

Oliver E W H M. 1959. *Medicinal plants of Nigeria*. Federal Ministry of Commerce and Industry, Lagos.

Onuaguluchi G. 1964. Anti-ascaric activity of certain extracts from the bark of *Polydoa umbellata* (Dalziel) (Erin-Yoruba). *West Afr. Med. J.* 13(4): 162–165.

**Oyedokun A O and Oladele O I 1999** Livestock Extension Services among Agricultural Development Projects in south western Nigeria. In proceedings of the 4<sup>th</sup> Annual Conference of Animal Science Association of Nigeria 14<sup>th</sup> - 16<sup>th</sup> September at International Institute of Tropical Agriculture, Ibadan, Nigeria p 180

**Padmakumar V 1998** Farmers' reliance on Ethnoveterinary practices to cope with common cattle ailments. In: Indigenous Knowledge and Development Monitor (6) 2 July. p 20

Plotnikov N N, Karnaukhov V K, Ozeretskoykaya N N, Stromskaya T F and Firsova R A. 1973. Clinical trials of cucurbitine (preparation of pumpkin seeds) in cestodiasis. *Helminthol. Abstr.* 42(3): 234.

**Rajan S. and Sethuraman M 1997** Traditional veterinary practices in rural areas of Dindigul district, Tamilnadu, India. In : *Indigenous Knowledge and Development Monitor* (5) 3 December. p 15

Sadavongvivad C. 1980. An ideal herbal drug faces ordeal. *Trends in Pharmacol. Sci.* 1(2):7–8.

Sen H.G., Joshi B S, Parthasarathy P and Kamat V N. 1975. Anthelmintic efficacy of diospyrol and its derivatives. *Helminthol. Abstr.* 44(11):991.

Sharma L D, Bahga H S and Soni B K. 1967. Anthelmintic screening of three indigenous medicinal plants against *Ascaridia galli* in poultry. *Indian Vet. J.* 44(8): 665–669.

Srivastava M C and Singh S W. 1967. Anthelmintic activity of *Cucurbita maxima* (Kaddu) seeds. *Indian J. Med. Res.* 55(6): 629–632.

Standen O D. 1963. *Chemotherapy. Vol. 1.* Academic Press, New York. pp. 701–892.

Stoll M A. 1947. This wormy world. *J. Parasitol.* 33: 1–18.

**Toyang N J, Nuwanyakpa M, Ndi C, Django S and Kinyuy W C 1995** Ethnoveterinary medicine practices in the Northwest Province of Cameroon. In : *Indigenous Knowledge and Development Monitor* (3) 3 December. p24

**Tewe O O 1997** Sustainability and Development : Paradigms from Nigeria's Livestock Industry. Inaugural Lecture series. University of Ibadan Press. Ibadan. p 4

Varghese C G, Jacobo P D, Georgekutty P T and Peter C T. 1971. Use of cashew (*Anacardium occidentale*) nut sheet oil as an anthelmintic against ascaridiasis in the domestic fowl. *Kerala J. Vet. Sci.* 2(1): 5–10.

WALLER, P. J. (1997): Anthelmintic resistance. *Vet. Parasitol.* 72, 391-405.

**Walter A and Dietrich F 1992** Role of traditional medicine among nomads of Somalia. *Traditional Veterinary Practice in Africa.* GTZ No 243 Eschborn Germany

**West K.B 1990** An overview of livestock production in Nigeria. Paper presented at the National Conference on Nigerian Livestock Industry and Prospects for the 1990's. Organised by NISER and Federal Department of Livestock and Pest Control pp2-3.

Whitlock J H. 1945. Anthelmintic bioassay of simple saturated hydrocarbons. *Cornell Vet.* 35:214–220.

**Williams S K T 1981** Instruction and Organisation of Agricultural Extension Services In Nigeria. A paper presented at the workshop on Utilisation of Agricultural Research Results in Nigeria, at Institute of Strategic Studies. Kuru, Nigeria July pp25-36