Epidemiology of helminthosis of small ruminants under the traditional husbandry system in eastern Nigeria

ARTICLE *in* VETERINARY RESEARCH COMMUNICATIONS · FEBRUARY 1990

Impact Factor: 1.24 · DOI: 10.1007/BF00343216 · Source: PubMed

1 AUTHOR:

Barineme Beke Fakae
Rivers State University of Science and Tech…

31 PUBLICATIONS **397** CITATIONS

SEE PROFILE

Veterinary Research Communications, 14 (1990) 381–391

THE EPIDEMIOLOGY OF HELMINTHOSIS IN SMALL RUMINANTS UNDER THE TRADITIONAL HUSBANDRY SYSTEM IN EASTERN NIGERIA

B.B. FAKAE
Department of Veterinary Parasitology and Entomology, University of Nigeria, Nsukka, Nigeria
Present address: Centre for Tropical Veterinary Medicine, Easter Bush, Roslin, Midlothian EH25 9RE, UK

ABSTRACT

Fakae, B.B., 1990. The epidemiology of helminthosis in small ruminants under the traditional husbandry system in eastern Nigeria. *Veterinary Research Communications*, 14 (5), 381–391

The epidemiology of helminth infections in West African dwarf sheep and goats under the traditional husbandry system prevailing in the derived savanna area of eastern Nigeria was studied for 12 months. The infections observed were due to *Haemonchus contortus* (87.1%), *Trichostrongylus* spp. (63.8%), metacestodes of *Taenia hydatigena* (30.2%), *Oesophagostomum columbianum* (22.4%), *Strongyloides* sp. (18.8%), *Cooperia* spp. (17.2%), *Gaigeria pachyscelis* (6.0%), *Moniezia expansa* (6.0%), *Bunostomum trigonocephalum* (4.3%), *Trichuris ovis* (3.5%), *Capillaria* sp. (0.9%) and paramphistomes (0.9%). Mixed infections were most prevalent. The endemicity of parasitic gastroenteritis in the area was indicated by the high prevalence of the helminths irrespective of the season of the year. The overall trend in helminthosis in these animals was that of an escalating worm burden during the period of confinement (April – October) and a low worm burden when animals were allowed free range (November – March), these periods corresponding to the cropping and harvest seasons respectively. A strong positive correlation ($r = 0.73$; $p<0.01$) was obtained between the mean strongyle worm burden and the eggs per gram (EPG) of faeces. A single treatment with a broad spectrum anthelmintic followed by movement into clean sheds at the beginning of confinement is suggested to give control of helminthosis in small ruminants in this area.

Key words: epidemiology, sheep, goats, helminth, traditional husbandry, derived savanna, Nigeria

INTRODUCTION

West African dwarf (WAD) sheep and goats are the only small ruminants which are ubiquitous in villages throughout the Nigerian rain forest and the derived savanna areas. These animals are traditionally reared, usually in small units of two to ten animals, to fit into the pattern of cropping activities in the villages (Matthewman, 1980; Bayer, 1986; ILCA, 1987). The animals have great economic potential because of their high fertility, fecundity, prolificacy and early maturity as well as their adaptability to the hot humid environment (Adenosun, 1988). However, disease often prevents them from attaining optimum productivity, especially under the traditional husbandry system. Parasitic gastroenteritis (PGE) has been noted as one of the major causes of this suboptimal productivity (Chiejina, 1986).

At present the only information available on helminthosis in sheep and goats in southern Nigeria is either based on faecal analysis alone or on the *post mortem* examination of the gastrointestinal contents of animals slaughtered in urban abattoirs. Since the majority of the animals slaughtered at these abattoirs are purchased from

northern Nigeria (Alaku and Igene, 1986) and are usually of unknown history, data obtained from such studies cannot properly reflect the epidemiological situation in the wetter and more humid southern part of Nigeria, in communities which also have a different ecology and husbandry practices from those in the northern savannas.

It was therefore desirable to undertake a study designed to provide reliable information on the epidemiology of helminth infections of small ruminants under the traditional husbandry system prevailing in the derived savanna area of the subhumid zone of eastern Nigeria.

MATERIALS AND METHODS

The traditional husbandry system

In the main, the traditional animal husbandry system in eastern Nigeria may be described as semi-intensive (Anon, 1986). In the derived savanna, the management of small ruminants is characterized by seasonal confinement (Francis, 1988) and this is determined to a large extent by the agricultural practices. With the increase in the human population density and the decreasing area of agricultural land, this system is increasingly being adopted by those few communities which still practise extensive rearing of WAD sheep and goats.

During most of the cropping and growing season (April to October), which coincides with the rainy season, most animals are kept permanently in huts to avoid damage to crops. They are zero-grazed on cut grass, herbs and leaves from trees, the left-over materials from these serving as animal bedding. A few animal owners choose to tether their animals on the available uncultivated lands but even such animals are taken in when the weather becomes inclement.

By contrast, during the dry season (November to March) when most root crops are harvested, the animals are allowed to roam freely and graze or browse on the natural range containing dried-out grass, shrubs and harvest residues. During all seasons, domestic waste such as cassava, yam, banana and plantain peels, as well as grain residues are provided in the animal sheds as supplementary feed.

From the onset of the rainy season, when the animals are housed permanently, there is usually an accumulation of faeces, urine and old bedding, which is infrequently removed. Most animal owners change the litter only after about six months, when the underlying layers may have decomposed enough to serve as manure, which is removed onto the farmlands near the homesteads intended for cultivation during the current or the next planting season.

These animals usually receive little or no veterinary care and are never routinely dewormed.

Parasitological procedure

The investigation was carried out in villages around Nsukka which is located in the derived savanna zone of eastern Nigeria (Figure 1). From August 1987 to July 1988, a total of 116 samples consisting of the entire alimentary tract of adult WAD sheep and goats were examined. These were collected monthly from animals reared locally and slaughtered in village markets.

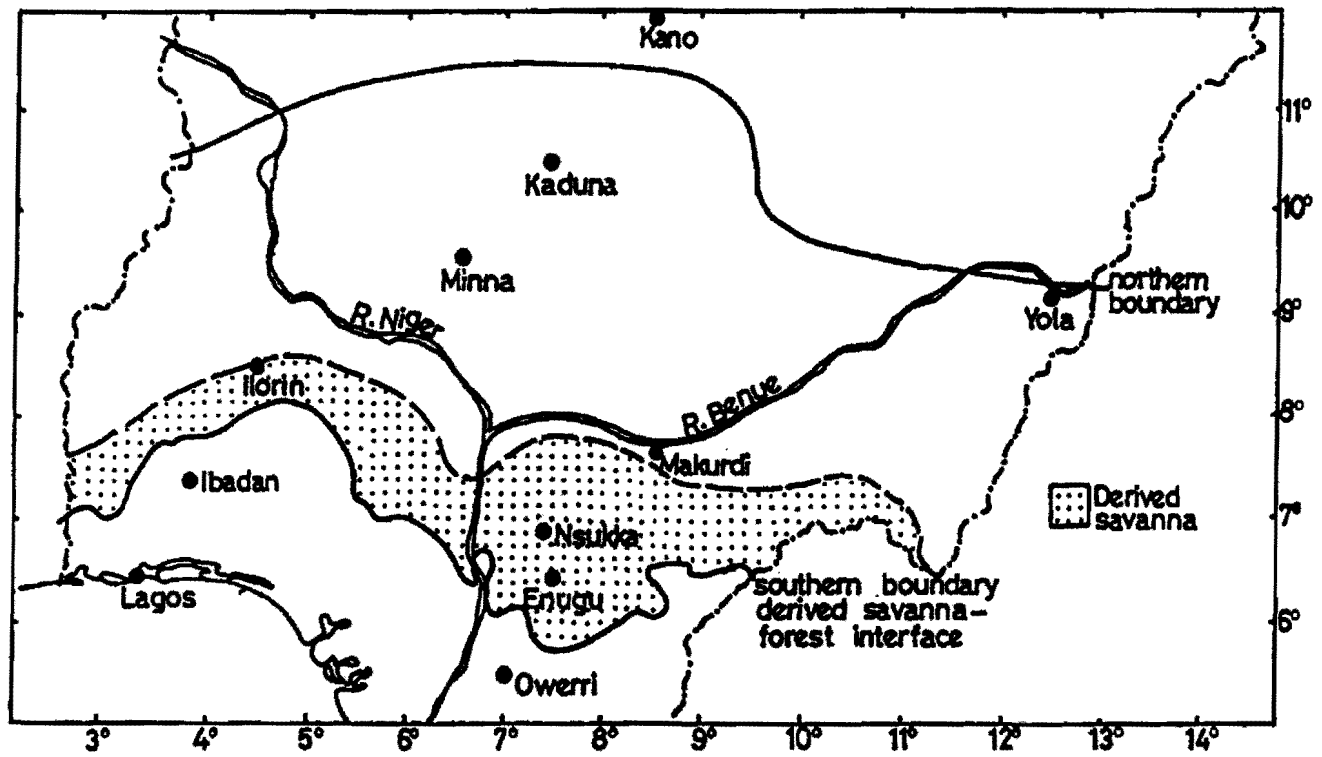

Figure 1. Map of Nigeria showing the boundaries of the sub-humid zone and the derived savanna area (after ILCA, 1987)

Faecal samples were collected from the rectum of each animal for worm egg count (MAFF, 1977) and the results were expressed as eggs per gram (EPG) of fresh faeces.

Apart from the rumen, which was emptied of the ingesta and examined on the spot, the other sections of the gastrointestinal tract were tied off to avoid migration or loss of their contents. These were then transferred to the laboratory and their contents processed by repeated washing, sedimentation and decantation (Fakae, 1990). Worms were identified and enumerated according to MAFF (1977). The identification of the *Capillaria* sp. was made at the CAB International Institute of Parasitology, St. Albans, UK.

Statistical analysis

Conventional analysis of variance (ANOVA) and correlation methods were used on logarithmically transformed values of worm burdens and egg counts.

RESULTS

Species composition and prevalence of infections

As fewer sheep than goats were slaughtered monthly, with none in January, March, May and July (see Table II) it was not possible to compare directly the monthly figures for sheep against goats; however, *Cooperia* spp. were observed predominantly in the sheep. The species of helminths recovered and their prevalence rates are shown in Table I. In all, 12 helminth genera comprising nine nematodes, two cestodes and one trematode were isolated. The nematodes were most common, with *Haemonchus contortus* being the most prevalent, followed by *Trichostrongylus* spp., *Oesophagostomum columbianum*, *Strongyloides* sp. and *Cooperia* spp. Other nematodes recovered but at much lower prevalence rates included *Gaigeria pachyscelis*, *Bunostomum trigonocephalum*, *Trichuris ovis* and *Capillaria* sp. Of the cestodes, metacestodes of *Taenia hydatigena*, which were recovered from the animals' peritoneum were more common than the enteric cestode, *Moniezia expansa*. The only trematodes encountered were paramphistomes and these were the least prevalent of the helminths found.

Only two (1.7%) of the animals had no infection, the rest being infected with between one and six species of helminths (Figure 2). Infections with a single species (22.4%) were mainly due to *H. contortus*.

The monthly prevalence of the strongyles did not follow any consistent pattern throughout the year but ranged from 70–100% for *Haemonchus*, 33–89% for *Trichostrongylus*, 0–36% for *Cooperia*, 0–50% for *Oesophagostomum*, 0–22% for *Gaigeria* and 0–11% for *Bunostomum* (Table II). Apart from *T. hydatigena*, the other helminths encountered showed a much lower and non-seasonal prevalence (Table III).

TABLE I
The prevalence of helminth species infecting small ruminants in the Nigerian derived savanna during August 1987 to July 1988

Species	Prevalence (%)
Haemonchus contortus	87.1
Trichostrongylus spp. (*T. axei* and *T. colubriformis*)	63.8
Taenia hydatigena	30.2
Oesophagostomum columbianum	22.4
Strongyloides sp.[a]	18.8
Cooperia spp. (*C. curticei* and *C. punctata*)	17.2
Gaigeria pachyscelis	6.0
Moniezia expansa	6.0
Bunostomum trigonocephalum	4.3
Trichuris ovis	3.5
Capillaria sp.	0.9
Paramphistomes	0.9

[a] Only the eggs were recovered in faecal samples

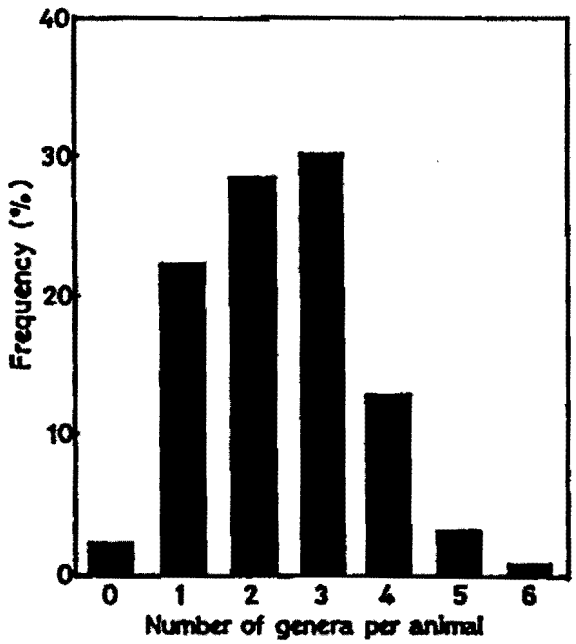

Figure 2. Numbers of helminth genera and frequency of involvement in the helminthosis of small ruminants under the traditional management in the Nigerian derived savanna

TABLE II
Monthly prevalence and intensity of strongyle infections in sheep and goats traditionally reared in the Nigerian derived savanna

Month	Number of animals[b]	Prevalence (%) and mean burdens[a]					
		Haemonchus	*Trichostrongylus*	*Cooperia*	*Oesophagostomum*	*Gaigeria*	*Bunostomum*
1987							
August	3S+6G	78 (284)	67 (73)	22 (7)	22 (2)	0 (0)	11 (1)
September	3S+7G	70 (113)	60 (598)	10 (10)	10 (14)	10 (1)	10 (12)
October	2S+8G	90 (954)	80 (276)	20 (189)	50 (20)	0 (0)	10 (9)
November	3S+6G	89 (342)	78 (3331)	22 (320)	11 (2)	22 (3)	0 (0)
December	5S+6G	91 (153)	73 (77)	36 (88)	45 (11)	0 (0)	9 (1)
1988							
January	0S+12G	92 (85)	50 (55)	8 (10)	33 (3)	8 (1)	0 (0)
February	5S+5G	80 (46)	82 (75)	27 (64)	9 (3)	9 (1)	0 (0)
March	0S+9G	89 (36)	33 (82)	0 (0)	11 (1)	11 (2)	0 (0)
April	1S+7G	88 (115)	38 (31)	13 (75)	0 (0)	0 (0)	0 (0)
May	0S+10G	80 (380)	60 (94)	20 (8)	10 (1)	0 (0)	0 (0)
June	1S+8G	100 (282)	89 (164)	22 (16)	33 (1)	11 (1)	0 (0)
July	0S+9G	100 (337)	56 (243)	11 (16)	33 (1)	0 (0)	0 (0)

[a] The mean worm burden is indicated in brackets
[b] S = Sheep, G = Goats

TABLE III
Monthly prevalence and intensity of non-strongylate nematodes, cestodes and trematodes in small ruminants traditionally reared in the Nigerian derived savanna

Month	Prevalence[a] (%) and mean burdens[b]					
	Strongyloides[c]	*Trichuris*	*Capillaria*	Paramphistomes	*Taenia*	*Moniezia*
August	0	11 (1.33)	0 (0)	0 (0)	56 (0.9)	0 (0)
September	0	10 (6)	0 (0)	0 (0)	20 (0.04)	20 (0.8)
October	20	0 (0)	0 (0)	0 (0)	30 (0.7)	10 (0.5)
November	89	0 (0)	0 (0)	11 (0.3)	22 (0.4)	22 (0.7)
December	18	0 (0)	0 (0)	0 (0)	18 (0.2)	0 (0)
January	50	0 (0)	0 (0)	0 (0)	17 (0.2)	8 (0.01)
February	0	0 (0)	0 (0)	0 (0)	30 (0.2)	20 (0.2)
March	0	0 (0)	0 (0)	0 (0)	56 (0.8)	0 (0)
April	0	0 (0)	0 (0)	0 (0)	13 (0.3)	0 (0)
May	20	10 (0.5)	0 (0)	0 (0)	30 (0.6)	0 (0)
June	11	0 (0)	0 (0)	0 (0)	44 (7.2)	0 (0)
July	22	0 (0)	11 (0.1)	0 (0)	56 (1.3)	0 (0)

[a] Same numbers of animals as in Table II
[b] The mean worm burden is indicated in brackets
[c] Prevalence based on faecal analysis alone

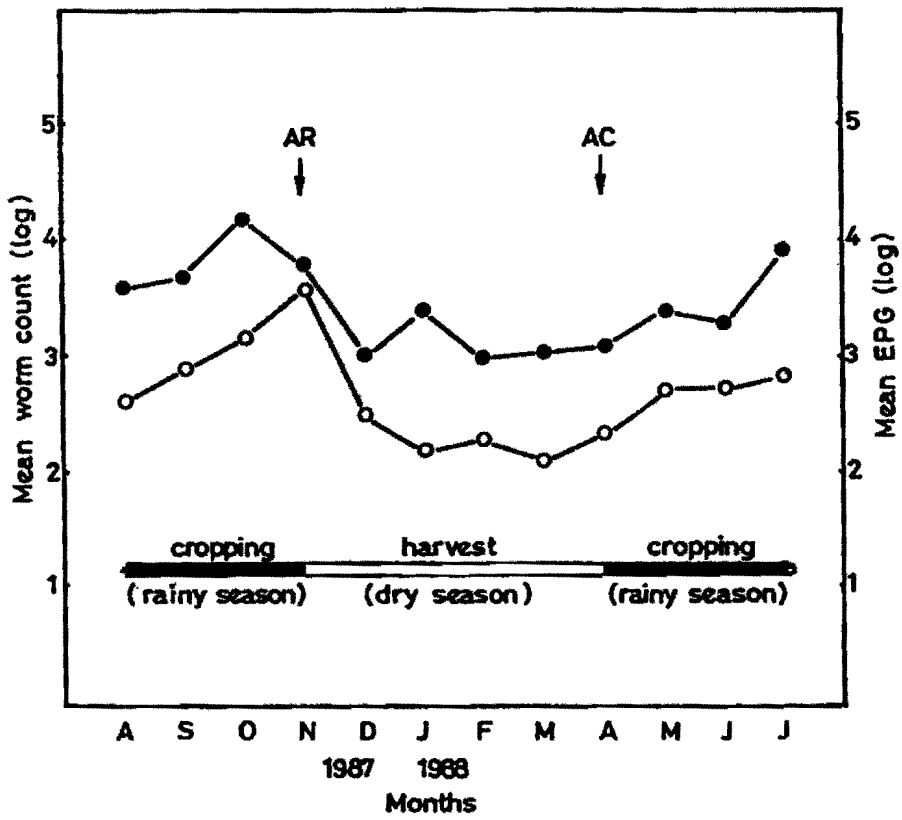

Figure 3. The mean monthly strongyle burden (o—o) and the mean monthly EPG (●—●) of WAD sheep and goats related to the pattern of cropping and traditional husbandry system in the Nigerian derived savanna. AR = animals released and AC = animals confined

Worm burden and faecal worm egg count

Although there was no regular pattern in the burden of cestodes, trematodes and non-strongylate nematodes (Table III), a definite seasonal trend was observed in the strongyle burdens and in the faecal worm egg counts of the animals. Worm burdens were lowest during January to April and rose steadily thereafter to a peak in November which was followed by a steep fall in December. Thus worm burdens were lowest during the harvest (dry) season and highest during the cropping (wet) season (Figure 3). The difference in worm burden between the two seasons was significant ($F=4.26$; $p<0.05$). On the whole, however, the mean worm burdens were generally low.

The strongyle egg count followed a similar pattern to the worm burden. Statistical analysis showed that there was a significant positive correlation ($r=0.74$; $p<0.01$) between the mean strongyle burden and the mean EPG. The mean EPG ranged from 1319 to 16 000 and 1050 to 2508 during the periods of confinement and extensive grazing respectively.

DISCUSSION

Small ruminant health problems in the tropics in general and Nigeria in particular have been much associated with helminthosis (Schillhorn van Veen, 1973; Chiejina, 1987). The spectrum of helminth species obtained in the present observation is broadly similar to those reported by Fagbemi and Dipeolu (1982) and by Smith and colleagues (1986) as being involved in PGE in the WAD sheep and goats in the humid zone. However, the report of *Capillaria* sp. is worth noting since it is the first record of this genus from small ruminants from the savanna area of Nigeria, although the low prevalence of this parasite suggests it is of little economic importance. The endemicity of helminthosis under the traditional husbandry system is reflected in the high proportion of animals infected irrespective of the season and worm burden (Table II). As the sheep and goats were similarly managed while in confinement when most infection occurred, any advantage of browsing over grazing would not have occurred. *Cooperia* spp. are known to be better adapted to sheep (Bisset, 1980). However, further studies involving equal numbers of sheep and goats under the present husbandry system would be needed to allow for a proper comparison of figures between these hosts.

Worm burdens and faecal egg counts were highest during the cropping season which also corresponds to the wet season, a period when animals were confined indoors on accumulated litter, which will have maintained constantly warm and moist conditions. In a study on three confined groups of 40 ewes, nine wethers and two stud rams, Hill (1960) observed that these were each able to produce an average of approximately 1.3 kg of fresh dung and urine in 24 hours. Under these conditions, if the old litter is not changed frequently, there would be an increase in the infected mass (Armour, 1980) and rapid development of the preparasitic stages, so ensuring the constant availability of infective forms in the animals' environment. Infection would then readily occur since the animals usually feed off their bedding. The worm burdens in the animals will thus have built up from the accumulating infection, in a very similar manner to that seen during the wet season on institutional farms, where animals are intensively reared (Anosa, 1977; Chiejina, 1987). However, the resultant worm burden in the housed animals were considerably lower than those generally observed in the latter situation, where poor management and inadequate nutrition readily predispose animals to increasing morbidity and heavy mortality due to PGE. The lethal effects of the dry season on larvae and even on worm eggs in faecal pellets on fields contaminated during the dry season (Chiejina *et al.*, 1989) precludes infection of the confined animals through grass cut from such fields.

In contrast, during the harvest (dry) season, when animals were on free range but the environmental conditions were highly unfavourable for preparasitic development (Chiejina *et al.*, 1989), there was a decline in worm burdens. Also, due to the extensive grazing or browsing by the animals during this period, there is usually a wide dispersal of their faecal pellets (Ikeme, 1983) with negligible numbers of infective forms in the animal sheds, to which they return only at night. Accordingly, the relatively low worm burden during this period may have been due to non-availability of infection to the animals coupled with the natural loss of worms. Fakae (1990) observed that, in the absence of any significant arrested development (Chiejina *et al.*, 1988), such a residual population of *H. contortus* survive the dry season mainly as adults and these repopulate the environment during the next favourable season.

Previous explanations for the commonly observed seasonal incidence of PGE and intensity of helminth infections in small ruminants in Nigeria were based mainly on climatic factors and their influence on the bionomics of the parasites (Fabiyi, 1973; Okon and Enyenihi, 1975; Fagbemi and Dipeolu, 1982). The present study shows that husbandry and agricultural practices can also influence the general pattern of infections in small ruminants. This is also evident from the studies on bovine PGE on the Jos Plateau by Pullan and Sewell (1980). Climatic factors and agricultural practices may act in concert to determine the pattern of infestation but the latter seem to be the predominant determinant of the outcome in traditionally managed small ruminants in eastern Nigeria.

The intensity of non-strongyle nematode, trematode and cestode infections in the animals in this study (Table III) was very low for most of the year and their prevalence did not show any seasonal pattern. This suggests that, under the prevailing management system, they may not be of much economic importance since such light burdens rarely cause any stress on the animals. A recent study by Emehelu (1988) has shown a 10% prevalence of *Taenia hydatigena* in village dogs in the derived savanna, which could be responsible for the moderate prevalence of the cysts of *T. hydatigena* observed in the small ruminants.

The strong correlation between the strongyle worm burden and EPG agrees with the observations of Roberts and Swan (1981) on ovine haemonchosis. This emphasizes the value of the faecal worm egg count as a quick and reliable technique for monitoring trends in strongyle worm burdens of small ruminants under field conditions.

The data presented here relate specifically to small ruminants maintained under the commonest system of husbandry in eastern Nigeria, but may apply to other traditional systems of husbandry, especially those which involve complete or prolonged confinement during the cropping season. For instance, the epidemiological pattern was similar to that observed in Ndamukong and colleagues (1987) in their studies on sheep and goats at Mankon, near Bamenda in the North West Province of Cameroon. However, the animals in that study were allowed to graze on tethers during the daytime in the rainy season and this probably accounts for the higher worm burden they acquired than did the animals in the present study, which were housed all the time during that season.

No information is currently available on helminth control programmes in the traditionally managed small ruminants in this part of the country. Since prevention of infection at the onset of the favourable season may be most beneficial, one possible method of control would be to treat all animals with an effective broad spectrum anthelmintic and move them to clean sheds with fresh bedding at the beginning of the confinement period. This should be followed by periodic removal and replacement of bedding during this period. Since the worm burdens are generally low, such animals should not require any more than this single anthelmintic treatment.

ACKNOWLEDGEMENTS

The author acknowledges with thanks the support of the Wellcome Nigeria Fund (1986 Research Grant Award). He is most grateful to Dr S.N. Chiejina and Professor M.M. Ikeme for their critical and useful comments on the manuscript and assistance with statistical analyses. The help of Dr L.M. Gibbons who identified the specimens sent to CAB International Institute of Parasitology, St Albans, UK, is also highly appreciated.

REFERENCES

Ademosun, A.A., 1988. Appropriate management systems for the West African dwarf goat in the humid tropics. In: O.B. Smith and H.G. Bosman (eds.), *Goat Production in the Tropics*. Proceedings of a workshop at the University of Ife, Ile-Ife, Nigeria, 20–24 July, 1987, Pudoc Wageningen, pp. 21–28

Alaku, O. and Igene, J.O., 1986. Factors influencing trade movement of sheep and goats from the Sahel to the sub-humid and humid zones of West Africa with particular reference to Nigeria. *World Review of Animal Production*, 22, 51–56

Anon., 1986. A survey of small ruminant production and marketing under traditional and institutional management systems in Nigeria (The Small Ruminant Research Group of the Nationally Co-ordinated Research Programme). Federal Ministry of Science and Technology, Lagos, Nigeria, 25 pp.

Anosa, V.O., 1977. Haematological observations on helminthiasis caused by *Haemonchus* in Nigerian dwarf sheep. *Tropical Animal Health and Production*, 9, 11–17

Bayer, W., 1986. Traditional small ruminant production in the sub humid zone of Nigeria. In: *Livestock Systems Research in Nigeria's sub-humid zone*. Proceedings of the 2nd ILCA/NAPRI Symposium (Kaduna, Nigeria, 29 October – 2 November, 1984), pp. 141–166

Bisset, S.A., 1980. Goats and sheep as hosts for some common cattle trichostrongylids. *Veterinary Parasitology*, 7, 363–368

Chiejina, S.N., 1986. The epizootiology and control of parasitic gastroenteritis of domesticated ruminants in Nigeria. *Helminthological Abstracts*, 55, 413–429

Chiejina, S.N., 1987. Some parasitic diseases of intensively managed West African dwarf sheep and goats in Nsukka, eastern Nigeria. *British Veterinary Journal*, 143, 246–272

Chiejina, S.N., Fakae, B.B. and Eze, B.O., 1988. Arrested development of gastrointestinal trichostrongylids in goats in Nigeria. *Veterinary Parasitology*, 28, 103–113

Chiejina, S.N., Fakae, B.B. and Eze, P.I., 1989. Development and survival of free-living stages of gastrointestinal nematodes of sheep and goats on pasture in the Nigerian derived savanna. *Veterinary Research Communications*, 13, 103–112

Emehelu, C.O., 1988. *Helminthiasis of dogs in rural communities in Nsukka area of Anambra State. Its prevalence and treatment with fenbendazole and ivermectin*. MSc dissertation, University of Nigeria, Nsukka

Fabiyi, J.P., 1973. Seasonal fluctuations of nematode infestations in goats in the savanna belt of Nigeria. *Bulletin of Epizootic Diseases of Africa*, 21, 277–286

Fagbemi, N.O. and Dipeolu, O.O., 1982. Strongyle infestations of small ruminants in Nigeria. *Veterinary Parasitology*, 11, 347–353

Fakae, B.B., 1990. Seasonal changes and hypobiosis in *Haemonchus contortus* infection in the West African Dwarf sheep and goats in the Nigerian derived savanna. *Veterinary Parasitology*, 36, 123–130

Francis, P.A., 1988. Livestock and farming systems in South-East Nigeria. In: O.B. Smith and H.G. Bosman, *Goat Production in the Tropics*. Proceedings of a workshop at the University of Ife, Ile-Ife, Nigeria, 20–24 July, 1987, Pudoc Wageningen, pp. 159–169. Published by the Science Association of Nigeria

Hill, D.H., 1960. West African dwarf sheep. 3rd Annual Conference of the Science Association of Nigeria, December 1960, University College, Ibadan

Ikeme, M.M., 1983. Parasitic diseases of small ruminants in Nigeria: Present and future trends in relation to husbandry practice. *Nigerian Veterinary Journal*, 12, 87–90

ILCA, 1987. International Livestock Centre for Africa, Annual Report 1986/7, Addis Ababa, Ethiopia, xiii + 82 pp

MAFF, 1977. *Manual of Veterinary Parasitological Laboratory Techniques*. (Ministry of Agriculture, Fisheries and Food. Technical Bulletin No. 18, HMSO, London), v + 129 pp

Matthewman, R.M., 1980. Small ruminant production in the humid tropical zone of southern Nigeria. *Tropical Animal Health and Production*, 12, 234–242

Ndamukong, K.J.N., Sewell, M.M.H. and Asanji, M.F., 1987. Productivity of sheep and goats under three management systems at Bamenda, Cameroon. *Tropical Animal Health and Production*, 19, 237–244

Okon, E.D. and Enyenihi, U.K., 1975. Incidence of *Haemonchus contortus*, *Gaigeria pachyscelis* and *Oesophagostomum columbianum* in goats in Nigeria. *Bulletin of Animal Health and Production in Africa*, 23, 145–153

Pullan, N.B. and Sewell, M.M.H., 1980. Parasitic gastro-enteritis in calves on the Jos Plateau. *Tropical Animal Health and Production*, 12, 203–208

Roberts, J.L. and Swan, R.A., 1981. Quantitative studies on ovine haemonchosis. I. Relationship between faecal counts and total worm counts. *Veterinary Parasitology*, 8, 165–171

Schillhorn van Veen, T.W., 1973. Small ruminant health problems in northern Nigeria with emphasis on helminthosis. *Nigerian Veterinary Journal*, 2, 26–31

Smith, O.N., Ayeni, A.O., Onawunmi, A.O. and Ademosun, A.A., 1986. Helminths and haemaprotozoan parasites on dwarf goats in South-Western Nigeria. *Bulletin of Animal Health and Production in Africa*, 34, 67–70

(Accepted 25th April 1990)