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ARTICLE

Gastrointestinal Nematodes and Body Condition Scores of Goats Slaughtered in Nsukka, Nigeria.

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SUMMARY

Gastrointestinal (GI) nematodes of 210 trade goats slaughtered in Nsukka area of Enugu state and their effects on body conditions was studied between May and August, 2011. The body condition of each goat were determined and scored on a scale of 1 – 5. Faecal samples were then collected from the goats before slaughter and their respective GI tract washings after slaughter for parasitological examination using standard procedures. The results revealed that Strongyles were the most prevalent nematode encountered in the goats (90.0%). The prevalence of mixed infection were 40.95%, 12.87%, 9.52% and 11.09% respectively for Strongyle + Strongyloides, Strongyle + Trichuris, Strongyloides + Trichuris and Strongyle + Strongyloides + Trichuris. *Haemonchus contortus* was the predominant nematode infecting the goats followed by *Trichostrongylus spp, Oesophagostomum spp* and *Strongyloides* spp in that order. Sex and age of the animals were shown to have association with prevalence but significant ($p > 0.05$) difference was not found. There was an inverse and significant ($p \mp 0.05$) relationship between body condition scores and the duo of mean egg per gram of faeces and adult worm burden of the goats. We concluded that GI nematode parasites are major problems of the goats slaughtered in Nsukka abattoir and the parasites had a remarkable effect on the body condition scores of the goats.

KEY WORDS: Gastrointestinal nematode; prevalence; goats; body condition score; Nigeria

INTRODUCTION

Goats play an important role in food production systems in developing countries which hold up to 96% of the world's goat population (Jansen and van den Burg, 2004). Their popularity has been attributed to good adaptation to many different climates (ecological adaptation), the many uses for which they can be kept and the very wide acceptability of goat meat by the people (Omeke, 1988). However, these benefits are seriously affected by high mortality and low productivity of which infections with gastro intestinal nematode parasites are the major contributing factor (Over *et al.,* 1996). It has been further noted that gastrointestinal parasite infections in sheep and goat result in considerable economic loss particularly the sub chronic form of the infection and such losses could be direct through mortality or indirect in the form of weight loss, poor milk, meat and wool production, carcass and offal condemnation, impaired reproductive performance, cost of treatment and control (SchillhornVan Veen, 1973; Akerejola *et al.,* 1979; Chiejina, 1987b).

The prevalence and effects of gastro intestinal nematodes in small ruminants vary considerably depending on the genera of nematode involved, the animal species, and local environmental conditions such as humidity, temperature, rainfall,

vegetation, and management practices. There is therefore, need for a periodic surveillance of the prevalence of gastrointestinal nematodes within a given environment for successful formulation and implementation of an efficient and effective worm control strategy. Till date, there is scanty documented information on the prevalence of GI nematode infections and their effects on the body conditions of trade goats in the derived savanna zone of South eastern Nigeria in particular and the country generally.

Body condition scoring is generally considered the best and simplest indicator of available fat reserves which can be used by the animals in periods of high energy demand, stress or suboptimal nutrition (Detweiler *et al.,* 2008) which are characteristics of GI nematode infections (Kyriazakis *et al.,* 1996;Coop and Kyriazakis, 1999). It has long been established that a cardinal feature of all GI helminth infections is the loss of considerable quantities of host protein into the GI tract and consequent changes in protein synthesis in host tissues which ultimately will manifest in the body condition of the host (Holmes, 1993). This study was therefore designed to determine the GI nematodes of trade goats slaughtered at the Nsukka abattoir and their effects on the body conditions of the goats.

MATERIALS AND METHODS

Study Area

Nsukka is located in the derived savanna zone of eastern Nigeria lying approximately between longitude 6°52' - 7°53'E and latitude 6°38' - 7°8'N.

Animals

A total of 210 trade goats predominantly of the Red Sokoto breed were used for the study. The goats comprised 30 young (6 – 12 months) and 180 adult (> 12 months) animals (Holst and Denney, 1980). They were randomly selected from the slaughter slab and their clinical status, age, sex and breed recorded.

Sample collection and examination

Prior to slaughter, the body condition score (BCS) of each selected goat was determined by feeling the level of muscling and fat deposition over and around the vertebrae in the loin region (Russel, 1991). Faecal samples were collected directly from the rectum of the animal into appropriately labeled sample bottles. Faecal examinations were done by the saturated sodium chloride floatation method while egg counts were determined by the modified McMaster technique (MAFF, 1977). Faecal culture and larval recovery were done as described by MAFF (1977).

Following slaughter and evisceration, the intact gastro-intestinal tract of each animal was dissected out and separated into the component sections by ligature in order to avoid admixture of their contents. Examination for adult nematode species was done as described by Hansen and Perry (1994).

Statistical analysis

Data obtained were analysed by the student t-test or One-way ANOVA using SPSS version 15 and variant means separated by Duncan's multiple range test. The results were summarized as means ± standard errors of the means (S.E.M).

RESULTS

Prevalence of gastrointestinal nematode ova

Of the 210 faecal samples examined, 208 (99.0%) were positive for nematode eggs (Table 1). Strongyle eggs were most prevalent 202 (96.2%) followed

respectively by *Strongyloides* eggs 36 (17.1%) and *Trichuris* eggs 14 (6.7%). Mixed infections were recorded in 158 (75.2%) of the animals. The mean (1561.7 ± 188.9) eggs/gram of faeces for strongyle was significantly higher ($p < 0.01$) than those of *Strongyloides* and *Trichuris* eggs (Table 1).

Effect of age and sex on the faecal egg count

All the eight male goats were positive for nematode eggs (100%) while only 99% of the females had eggs in their faeces. The prevalence of nematode egg excretion and the mean egg/gram of faeces (EPG) recorded for the male goats were significantly lower ($P < 0.05$) than that of the females (Table 1). There was no significant difference ($P > 0.05$) in the prevalence and mean EPG of faeces between young and adult goats.

Differential larval and adult worm counts

Faecal culture and larval recovery revealed predominantly *Haemonchus* (48.8%), *Trichostrongylus* (20.2%), *Oesophagostomum* (18.9%) and *Strongyloides* (12.0%) species (Table 2). Post mortem examination further confirmed the predominanace of adult stages of these species (Table 3). Other adult worm species recovered were *Trichuris,* and *Gaigeria* species. Detection of infected animals by post mortem examination for adult stages *in situ* revealed relatively higher prevalence (100%) than the detection by faecal examination (99.1%).

Effect of gastrointestinal nematodes on body condition scores (BCS)

All the goats (100%) with body condition score (BCS) of 1 (very poor), 2 (poor) and 3 (fair) were infected with GI nematodes while 90.9 and 95% of those with BCS of 4 (good) and 5 (very good) had nematode infections (Table 4). The mean egg/gram of faeces (EPG) and worm burden (Wb) of the goats with BCS 5 and 4 were significantly lower ($p < 0.05$) than those with BCS of 1, 2 & 3. Also animals with BCS of 2 & 3 (poor and fair) had significantly lower ($p < 0.05$) FECs and Wb than those with BCS 1 (very poor) (Table 4). There was no significant difference ($p > 0.05$) in mean FEC and Wb, between goats with BCS of 4 and 5 but these were significantly ($p < 0.05$) lower than the mean FEC and Wb of goats with BCS of 1, 2 and 3 respectively (Table 4). Mean FEC and Wb varied significantly ($p < 0.05$) between goats with BCS of 1, 2 and 3; FEC and Wb reducing with increasing body condition scores.

There was an inverse and high significant correlation between the BCS of the goats and their EPG of faeces ($R_s = -0.822$, $p < 0.01$) and between BCS and prevalence rates ($R_s = -0.894$, $p < 0.05$). The relationship between BCS and adult worm burden was also highly significant but negative ($R_s = -0.945$, $p < 0.01$).

TABLE I: Prevalence of gastro intestinal nematode eggs isolated from trade goats examined at Nsukka, Nigeria.

	Number Examined	No. (%) infected	Egg/gram of faeces	Range
All goats	210	208 (99.0)		
Sex of goats				
Male	8	8 (100)	531.71 ± 216.4[a]	18 – 2000
Female	202	200 (99.0)	1639.1 ± 200.2[b]	2 – 4950
Age of goats (months)				
6 – 12	30	29 (96.7)	1333.7 ± 376.3	2 – 4950
> 12	180	179 (99.4)	1551.1 ± 207.1	2 – 2650
Egg types				
Strongyle	210	202 (96.2)	1561.7 ± 188.9[a]	2 – 4950
Strongyloides	210	36 (17.1)	6.9 ± 1.2[b]	1 – 76
Trichuris eggs	210	14 (6.7)	2.94 ± 0.4[c]	1 – 6
Mixed infections	210	158 (75.2)	1922.0 ± 234.6[a]	3 – 4950

Figures with different superscripts within column for sex and age of goats and egg types are significantly different ($p = 0.05$

TABLE II: Species of nematodes determined by larval culture

Nematode species	Proportion of larvae (%)
H. contortus	48.8
T. colubriformis	20.2
Oesophagostomum	18.9
Strongyloides spp	12.0

TABLE III: Adult worm counts of trade goats examined at Nsukka, Nigeria.

Adult worm species	Prevalence (%)	Mean ± SE	Range	Proportion of recovery (%)
H. contortus	100	518.7 ± 110.29	2 - 610	49.6
T. colubriformis	100	240.7 ± 113.11	0 - 480	20.8
Oesophagostomum spp	97.9	132.5 ± 19.48	4 - 265	18.9
Strongyloides spp	35.6	110.3 ± 14.13	0 - 143	7.3
Trichuris spp	18.3	15.17 ± 2.45	2 - 19	2.3
Gaigeria spp	4.8	4.50 ± 1.50	0 - 12	1.1

TABLE IV: Egg counts per gram of faeces and body condition scores of trade goats examined at Nsukka, Nigeria.

BCS	Number examined	No and (%) infected	Mean Epg ± SEM	Mean Wb ± SEM
1 (Very poor)	21	21 (100)	5002.41 ± 960.09 [a]	307.67 ± 49.33 [a]
2 (Poor)	80	80 (100)	1585.60 ± 134.89 [b]	214.00 ± 15.01 [b]
3 (Fair)	78	78 (100)	414.97 ± 57.85 [c]	159.67 ± 23.84 [c]
4 (Good)	20	19 (95)	43.54 ± 11.95 [d]	61.67 ± 25.06 [d]
5 (Very good)	11	10 (90.9)	37.07 ± 3.24 [d]	28.33 ± 5.51 [d]

Figures with different superscripts within columns are significantly different ($p = 0.05$)

DISCUSSION

The results of this study showed that goats slaughtered at the Nsukka abattoir are commonly infected with a variety of gastro-intestinal nematode species with a very high prevalence (99.1%) and generally high faecal egg count (FEC). The prevalence reported in this study is within the range reported from different geographical zones of the country (Fagbemi and Dipeolu, 1982; Chiejina, 1986: Nwosu *et al.,* 1996) and elsewhere in Africa (Esayas, 1988; Fritche *et al.,* 1993; Mbuh *et al.,* 2008). It is however, much higher than the 51.3% reported by Biu *et al.,* (2009) in ruminants at the University of Maiduguri Teaching and Research Farm and the 55% reported by *Dagnachew et al. (2011) in* ***small ruminants of North Gondar zone, Northwest Ethiopia***. This study also reveals that strongyle species are the most prevalent nematodes in goats slaughtered at the Nsukka abattoir.

Although adult goats had relatively higher number of egg per gram of faeces than young goats, there was no significant ($p >$ 0.05) difference between the mean egg counts of both groups of animals. This disagrees with the experimentally supported (Gamble and Zajac 1992; Knox, 2000) hypothesis that older animals may have acquired immunity against gastrointestinal parasites and thus become less susceptible. However, it is assumed in this study that the goats classified as young (6 – 12 months) may have had previous nematode challenges with acquired immunity which makes them comparable to the adults. This finding is an indication that the young as well as the adult goats are both at risk of helminthosis

The prevalence of infections with GI nematodes was similar between the male and female goats, but mean EPG was significantly lower ($p< 0.05$) in the males compared to the females. This observation disagrees with Barger (1993) who in a review of the effect of host's sex on resistance level reported that male sheep were more susceptible than females to natural and experimental infection with *H. contortus* and *T. colubriformis*. Courtney *et al.* (1985) also reported a significantly lower EPG in females than in males after puberty but not before puberty. It is believed that the reproductive status of the females may have contributed to the observed higher EPG in female goats as some pregnant does may have been inadvertently included in the study. The prevalence of pregnancy wastage consequent to indiscriminate slaughter of gravid sheep and goats in the abattoirs and slaughter points in Nigeria is reported (Alade *et al.,* 2011; Bokko, 2011) to be very high. Female animals often show increases in EPG during the periparturient period beginning in late pregnancy and rising to a peak in early lactation (Soulsby, 1982; Courtney *et al.,* 1984). However,

Dagnachew et al. (2011) reported a slightly higher prevalence of helminthosis in females (48.8%) than male goats (42.42%).

In the present study, larval culture and adult worm counts showed that *Haemonchus contortus* is the most prevalent (46.8%) nematode in the goats, followed by *Oesophagostomum* (17.2%), *Trichostrongyluscolubriformis* (20.2%) and *Strongyloides* species (12.0) in that order. Various workers (Schillhorn van Veen, 1973; Chiejina, 1987b) have shown that *Haemonchus contortus* is by far the most important and predominant parasite in most field outbreaks of parasitic gastroenteritis (PGE) in Nigeria. Our study therefore, suggests that *Haemonchus, Oesophagostomum* and *Trichostrongylus* in this order are the most important GI nematodes in goats. This is in agreement with earlier findings (Fabiyi, 1973; Okon and Enyenihi, 1975; Chiejina, 1986; Nwosu *et al.,* 1996) which observed that field outbreaks of PGE in small ruminants in Nigeria are usually due to mixed infections with several helminth parasites including *Haemonchus, Trichostrongylus, Oesophagostomum, and Gaigeria* species.

The inverse and high significant relationship observed in this study between body condition score (BCS) and the duo of mean EPG of faeces and adult worm counts suggest that the parasites had a significant effect on the BCS of the goats. Goats with high parasite burdens had poor body conditions whereas those with low worm burdens had good body conditions. Impaired protein utilization and metabolism resulting in poor weight gain and loss of body condition is a characteristic feature of all gastro-intestinal helminth infections in farm animals (Holmes, 1993). Parkins and Holmes, (1989) estimates the endogenous protein loss in haemonchosis to be as much as 10% of the circulating plasma volume. In trichostrongylosis, increased secretion of mucin and sloughing of epithelial cells into the GI tract can result in 4 to 5 g N/d increases in the endogenous Nitrogen components that leave the small intestine (Poppi *et al.,* 1986; Kimambo *et al.,* 1988). It is also possible that the body conditions of the goats influenced their susceptibility to the GI nematodes with goats having poor body conditions been more susceptible to the infection than those with good body conditions. It is generally accepted that well-nourished animals withstand parasitism better than those less adequately fed and the nutritional status of the host can influence the pathogenesis of parasitic infections (Coop and Holmes, 1996; Coop and Kyriazakis, 1999).

In conclusion, the study showed that GI nematode parasites are major problems of the goats slaughtered in Nsukka abattoir as evidenced by the high faecal egg and worm counts with *Haemonchus* species being the most prevalent of all the GI nematodes. Our findings show that age and sex have no significant effect on the susceptibility or otherwise of the goats to their GI nematodes as all categories are at risk to the infection. Nevertheless, the parasites had a remarkable effect on the BCS of the goats.

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