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Prevalence of Strongyle ova in Goats and comparative studies of some faecal culture techniques in Maiduguri, Nigeria

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ABSTRACT: Gastrointestinal parasitism is one of the major health problems affecting productivity of small ruminants worldwide. A dry season study was undertaken to determine the prevalence of *Strongyle* ova in goats and their faecal egg counts, as well as to compare different faecal culture methods for larval counts and identification. Out of 200 faecal samples examined, 114 were from male and 86 from female goats. An overall prevalence of 42(21%) for *Strongyle* ova was observed with a mean EPG of 91.67 $\pm$ 6.12. The prevalence was higher in the male 26(22.8%) than in female 16(18.6%) with mean EPG of 90.38 ± 7.35 and 93.75 ± 11.06 respectively ($p > 0.05$). It was also higher in adults 38(22.22%) compared with the young 4(13.79%). All positive goats were of the Sahelian breed. No significant difference ($p > 0.05\%$) was observed between sexes and age but a significant difference ($p < 0.05$) was observed between breeds. The infection was higher from samples collected in the abattoir 36 (25.35%) compared with 6(18.75%) in Mairi Village and none was positive from the University of Maiduguri Farm. A significant difference ($p<0.05$) was thus observed between locations. Only *Strongyle* ova was seen throughout the study and on subjection of the positive samples to larval recovery, *Oesophagostomum columbianum* was the only larva recovered. The test tube method yielded the highest larval recovery with mean larval count of 9.14 $\pm$ 0.72 ($p<0.05$), compared with bottle with no charcoal; bottle with charcoal and Baermann's techniques.

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The Nigerian goat population is estimated to be about 34.5 million and this constitutes an important source of milk and meat for local consumption and hides for export market (Lawal-Adebowale, 2012); nearly ninety percent (90%) of the small ruminants in Nigeria are found in the hands of small-holders (Alphonsus *et al.* 2010).

Epidemiological knowledge is crucial to the development of a comprehensive and sustainable strategy for controlling gastrointestinal nematode infections in sheep and goats in the different agro-ecological zones and management systems (Ardo and Bitrus, 2015).

Reports from various countries have shown that climate change especially elevated temperature, has already changed the overall abundance, seasonality and spatial spread of endemic helminths (Van Dijk *et al.,* 2010).

Host factors such as age, breed, nutrition, physiological status and presence or absence of inter-current infections also influence the incidence rate and severity of infection with gastrointestinal nematodes (Wadhawa *et al.,* 2011).

There is therefore, the need for a periodic surveillance on the prevalence of gastrointestinal nematodes within a given environment for successful formulation and implementation of an efficient and effective worm control strategy. Therefore, this study was conducted to provide information on the prevalence of caprine nematodosis and to compare different faecal culture techniques for larval counts and identification.

MATERIALS AND METHODS

Study Area: Borno State with Maiduguri as its capital lies between latitude 10.2^{0}N and 13.4^{0}N and longitude 9.8^{0}E and 14.4^{0}E with an area of 69,436 sq km located in the North eastern corner of Nigeria sharing borders with Niger to the North, Chad to the Northeast and Cameroun to the East (Figure 1) (Musa and Pindar, 2005).

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The State has Sahel vegetation in the North and a Sudan Savanna in the South.

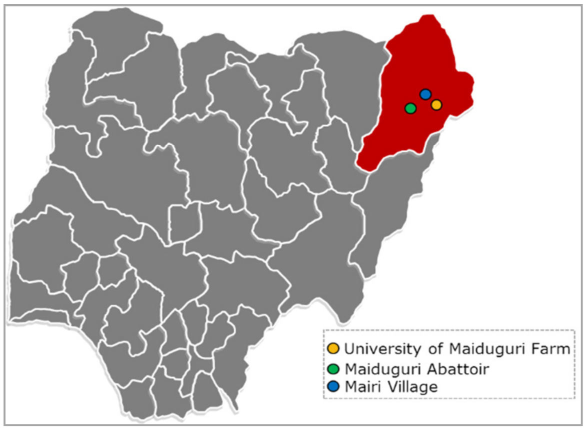

Fig 1: Map of Nigeria showing the study area Borno State as insert

Faecal Sampling and Examination: Convenient sampling technique was employed in this study. A total of 200 faecal samples were collected from various sources which included the University teaching and research farm, Maiduguri metropolitan abattoir and Mairi Village. Information on the age, sex (with those aged six months or below were regarded as young while those above as adult) and breed of goats were recorded.

Faecal samples were collected directly from the rectum of goats using the index finger in hand gloves into polythene bags and labeled properly. These were transported to the Parasitology Laboratory of the Department of Veterinary Parasitology and Entomology, University of Maiduguri. All samples were processed at most within 24 hours. A faecal examination was done using simple test-tube floatation and egg counts were determined using modified McMaster technique (Kaufmann and Pfister 1990).

Various faecal culture techniques were used such as Baermann's technique as described by Lok (2006); test tube or filter paper method as described by Martin-Rabadan *et al*., 1999; bottled charcoal method as described by Lok (2006) and bottle only without charcoal methods. The infective larvae of stronglyle nematodes were identified and enumerated based on the standard descriptions of Soulsby, (1982).

Statistical Analysis: Data obtained were analyzed as mean $\pm$ Standard Error of Mean or in percentages. Variations among means were determined at 5% level of significance using the analysis of variance (ANOVA) and Fisher's Exact Test (Graph pad Prism Version 5).

RESULTS AND DISCUSSION

An overall prevalence of 42(21.0%) for *Strongyle* ova was obtained in this study with mean EPG of 91.67±6.12 (Table 1).This was quite low compared with 58% reported in goats in an earlier work by Biu *et al*., (2009). The degree of infection observed throughout the study was light 91.67 (50-799). Of the 114 males examined, 26(22.8%) were positive with mean Egg per Gram (EPG) of 90.38 ± 7.35, while only 16(18.6%) of the 86 females examined were positive with mean EPG of 93.75 ±11.06. No significant difference ($p > 0.05$) was observed between sexes (Table 1).

Also, Out of 171 adults examined, 38(22.22%) were positive with mean EPG of 92.11 ± 6.67, while 4(13.79%) of the 29 young examined were positive with mean EPG of 87.50 ± 12.50 ($p > 0.05$) (Table 1).

The higher prevalence of gastrointestinal nematode in the males than in the females and in the adults than in the young may be due to large numbers of males as well as adults sampled in this study. Raza *et al*., (2013) also postulated that male animals are more likely to be infected than females being that the males are more aggressive when feeding and thus likely to pick up more ova of helminths than females on pasture.

However, determination of the degree of nematode infection depends mainly upon the age of the host, breed, the parasite species involved and the epidemiological patterns which include husbandry practices and physiological status of the animals (Tembely *et al*., 1997).

Only 5 West African Dwarf (WAD) goats were sampled in this study with 0(0%) prevalence while Sahel goats had a prevalence of 42(21.5%) with mean EPG of 91.67± 6.12 ($p < 0.05$). The influence of sex, age and breed difference on the prevalence of gastrointestinal nematodes has been reported by Regassa *et al*., (2006); Mbaya *et al*., (2009); Idika *et al*., (2012) and Paul *et al*., (2016).

Furthermore, the low prevalence recorded in this study may be influenced by season. Chiejina (1986) reported that worm burdens are generally higher during the rainy season than in the dry season but that significant sequence occurred in the succession and relative abundance of the various species.

Table 1 Prevalence of *Strongyle* ova from goats examined in Maiduguri, Borno State

Parameter	Number examined	Number infected (%)	EPG Mean ± S.E.M
Sex			
Male	114	26 (22.8)[a]	90.38 ± 7.35[a]
Female	86	16 (18.6)[a]	93.75 ± 11.06[a]
Total	200	42(21)	91.67 ± 6.12
Age			
Young	29	4 (13.79)[a]	87.50 ± 12.50[a]
Adult	171	38(22.22)[a]	92.11 ± 6.67[a]
Total	200	42(21)	91.67 ± 6.12
Breed			
West African Dwarf	5	0 (0)[a]	± 0.0[a]
Sahel goat	195	42(21.5)[b]	91.67 ± 6.12[b]
Total	200	42(21.5)	91.67 ± 6.12
Location			
University farm	26	0 (0)[a]	0.0 ± 0.0[a]
Mairi village	32	6 (18.75)[b]	58.33 ± 8.33[b]
Maiduguri abattoir	142	36(25.35)[c]	95.83 ± 6.42[c]
Total	200	42(21)	91.67 ± 6.12

Columns with different superscript (a, b, c) within the same variable shows significant difference (p<0.05)

Table 2: Sensitivity of different faecal larval recovery techniques employed in the study.

Techniques	Larval count (Mean ± SEM)
Baermann's method	2.25 ± 0.37[a]
Test tubes or paper strip	9.14 ± 0.72[b]
Bottle with charcoal	4.87 ± 0.76[a]
Bottle without charcoal	4.90 ± 1.10[a]

n= 42, number of positive faecal samples cultured Column with different superscript shows significant difference (p<0.05)

This study was conducted at the peak of the dry season (February-March) where the preponderance of gastrointestinal parasites is usually very low. According to Soulsby (1982), temperature and rainfall both play a significant role on the prevalence and development of pre-parasitic stages of nematodes in open pasture. The development and survival of strongyle nematode larvae occur throughout the year but decreased during the months of the dry season (Nwosu, 1995). High ambient temperatures in arid ecosystems hardly support the development and translocation of pre-parasitic stages of helminths in the environment (Nwosu, 1995). A higher prevalence was recorded from samples collected at the abattoir 36 (25.35%) with mean EPG of 95.83±6.42 compared with 6(18.75%) in Mairi village with mean EPG of 58.33 ± 8.33 and 0(0%) from the University farm ($p < 0.05$) (Table 1). All the infected goats in this study are the Sahelian breed of goats and they are the most abundant breed of goats in the semi-arid region of north eastern Nigeria. None of the goats examined on the university farm was positive to gastrointestinal helminths of goats. This could be due the fact that the animals kept in the farm are properly managed and routinely dewormed. This finding is contrary to earlier report by Biu *et al*., (2009) who reported a prevalence of 58% in goats at the same farm. The Maiduguri metropolitan abattoir had the highest prevalence, as animals slaughtered at the abattoir were brought from so many sources and managed under various husbandry conditions.

Four faecal culture techniques were used in this study. The "test tube method" had the highest larval recovery with mean ± SEM larval count of 9.14 ± 0.72 which is significantly higher ($p<0.05$) than the other methods such as "bottle with no charcoal" with mean± SEM larval count of 4.90 ± 1.10; "bottle with charcoal" with mean ± SEM larval count 4.87 ± 0.76 and "Baermann's technique" with the least mean ± SEM larval count of 2.25 ± 0.37 (Table 2).Similar observations were made by Nwosu *et al*., (1996). This method has been found useful for recovering of large number of infective larvae which may be required during an experimental work. In addition, the bottled with charcoal also yielded a good number of larvae and the fluid is usually clearer which helps in better counting of larvae. Only *Strongyle* ova were seen throughout the study period and this agrees with Biu *et al*., (2009) and Kantzoura *et al*., (2012) who reported *Strongyle* ova as the most prevalent of parasitic ova seen in their studies. Furthermore, using standard morphological keys, Only *Oesophagostom columbianum* larvae were recovered throughout the study. The reason for this observation may not be understood at the moment. Further work needs to be carried out to ascertain the probable factors responsible for this.

Conclusion: Conclusively, a low prevalence of *Strongyle* ova and faecal egg count was recorded in Maiduguri, Nigeria during the study period in different breeds, ages and sex of goats. The implications of these findings is that low infection rates takes place during the dry season and the high ambient temperature may have killed the infective larvae available for transmission thereby reducing the likelihood for infectivity and establishment of infection among goats within the study area.

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