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Pattern of Occurrence of Gastrointestinal Helminthiasis in Dairy Goat Breeds within Trans Nzoia County, Kenya

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

This study the examined feacal sampled from 1392 goats from Trans Nzoia area in Kenya for Gastro-Intestinal Helminths (GIH). A total of 642 (46.1%) were found positive for GIH. Trematodes were 22.1%, cestodes 12.6% and nematodes were the least prevalent at 11.4% with a mixed infection of 13.2%. Trematodes detected were *Fasciola* spp. (14.5%) and *Paramphistomum* spp. (7.1%). Only *Moniezia expansa* (12.4%) and *Moniezia benedeni* (9.2%) were detected cestodes while the nematodes were *Strongyloides* spp. (5.1%), *Trichostrongylus* spp. (2.6%), *Haemonchus* spp. (2.4%), *Trichuris* spp. (1.5%), *Oesophagostomum* spp. (1.0%) and *Cooperia* spp. (0.6%). There were significant differences ($P < 0.05$) in the infections between breeds with Saanen and Barbari having higher prevalence of the GI helminthes. Meanwhile East African had higher prevalence of trematodes, cestodes and nematodes while highest mixed infections occurred in Barbari. Young goats aged < 3 months were heavily infected with all groups of helminthes than the older goats aged > 3 months. In terms of seasonal differences, rainy season had higher prevalence of all groups of GI helminthes except mixed infection than dry seasons. The present research provided the prevalence pattern and risk factors associated with gastrointestinal helminthiasis in the tropical area.

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1. INTRODUCTION

Domestic goat is among the earliest animals domesticated by man. They are distributed worldwide with higher concentrations in tropical areas and in dry zones [1]. Among the cultured species, dairy goat farming which entails the raising and breeding of domestic female goats (*Capra aegagrus hircus*) for milk, meat, milk, fibre and skin is more widespread. Indeed dairy goats are reared since they form the most important group of milk producing animals after dairy cattle in both temperate and tropical agriculture [2]. Furthermore, dairy goats can be farmed with a relatively small area of pasture and limited resources [3]. Dairy goat production is an emerging enterprise, which has a lot of potential for poverty alleviation, improved nutrition, and increased income for the poor; goat farming is suited to production with other livestock such as goats and cattle on low-quality grazing land. The demand of dairy goats' milk is increasing because of the growing population of people, the increasing awareness of medicinal and nutritional status associated with goat milk and also the special interest in goat milk products, especially cheeses and yoghurt, in many developed countries which has led to increasing levels of disposable incomes [4]. Dairy goat has been used as source of income and source of food (meat and milk) especially to the poor [5].

Kenya has an estimated 32 million goats and about 710,000 dairy goats, where they are spread throughout all the agro-ecological zones of the country [6]. In particular, goats are suitable for small scale poor farmers as they are cheap to acquire compared to cattle, they require little land, they reproduce quickly, and they are able to feed on a wide range of forages. The goat population in Kenya is predominantly of the Saanen, Toggenburg, Barbari, indigenous Galla and East African goats reared in arid and semi arid areas (http://www.howtodiys.com/goat-farming-in-kenya/). Dairy goats in Kenya were obtained through a cross breeding programme between the indigenous goats and the exotic breeds and about eighty percent of these are reared in Mt Kenya and Riff Valley Region [6]. In the Rift Valley, Trans Nzoia and Nakuru Counties lead in the number of dairy goats. The fact that they can be reared in small land holdings is especially useful in these highly populated areas [7]. There are however, several challenges that dairy goat farming present including low production, diseases and occurrence of Gastro intestinal parasites.

Gastrointestinal parasitism leads to severe health ailments, limiting productivity of the animal [8-10]. Although production losses piles up to millions of lost incomes in meat and milk this problem is neglected time and again due to, its chronic and insidious nature [11]. As a result, it remains a major impediment in small ruminant production and this problem is severe in the tropics due to highly favorable environmental conditions for helminth transmission [12]. Studies concerning prevalence of gastrointestinal helminthiasis in goat of Kenya however, remain rather limited. Previous study conducted has shown that goats in majority of the Rift Valley Region have a major challenge of disease and pest outbreaks because these animals are reared in high density within the country [13]. Present work was aimed to access the prevalence and risk factors associated with gastrointestinal helminthiasis in goats of Trans Nzoia, Kenya.

2. MATERIALS AND METHODS

This study was carried out in croplands of Trans Nzoia County in Kenya (DMS Coordinates 1°06'0.00" N 34°57'0.00" E, altitude of 2100 m above sea level). The temperature range from 13.2ºC to 26.3ºC with an average of 16.6ºC. The mean rainfall is just over 1200 mm annually. Long rains occur between the months of March to May while December to February are dry months and September to October is the period of short rains. The study was conducted from February to June 2016. The present study was conducted on fecal sample basis, fecal samples were either collected freshly voided or directly from the animal with prior permission of the owners. The fecal samples were collected from 1392 goats in Trans Nzoia County from a total of 506 farmers distributed within the county. The samples were collected in dry season from 774 goats [from 302 farmers) and in the rainy season there were 618 goats (from 204 farmers) sampled. Collection was done one for each goat and the content transferred to labeled vial. The age of the goat were inquired from the farmers who had records about the time of birth. The breeds of the goat were determined by observation. The examinations of the helminthes were done on the same day of collection. The helminth eggs were detected with Modified Sheather's Sugar floatation technique and

Formal ether acetic acid technique (for trematodes) at the University of Eldoret Biological Sciences Laboratory. The samples were identified individually. A proximately 0.500 g were used for the analysis. The helminthes were identified at 400× magnification and oil immersion.

The association of different risk factors (i.e. season, age and sex) with the prevalence of GI helminthiasis was tested employing Chi-square test of independence of attributes. Risk factor correlations with $P < 0.05$ were considered significant and $P < 0.01$ were considered highly significant.

3. RESULTS

During the present study, a total of 1392 fecal samples of Trans Nzoia goats were examined, out of which 642 were found positive for gastrointestinal helminthiasis which translates to an overall prevalence of 46.1%. Trematodes were 22.1%, cestodes were 12.6% and nematodes prevalence was 11.4% with a mixed infection of 13.2% as shown in Table 1. There were significant differences ($P < 0.05$) in the infections between breeds with Saanen and Barbari having higher overall prevalence of the GI helminthes. Meanwhile East African had higher prevalence of cestodes and mixed infections. Young goats aged < 3 months were heavily infected with all groups of helminthes than the older goats aged > 3 months. In terms of seasonal differences, rainy season had higher prevalence of all groups of GI helminthes except mixed infection than dry seasons. Mixed infections were recorded to be highest in dry season (14.3%) than in rainy season (12.3%).

Only *Moniezia expansa* (12.4%) and *Moniezia benedeni* (9.2%) were detected cestodes in the goats. Different trematodes detected were *Fasciola* spp. (14.5%) and *Paramphistomum* spp. (7.1%). The nematodes found were *Strongyloides* spp. (5.1%), *Trichostrongylus* spp. (2.6%), *Haemonchus* spp. (2.4%), *Trichuris* spp. (1.5%), *Oesophagostomum* spp. (1.0%), *Bunostomum* spp. (0.8%) and *Cooperia* spp. (0.6%) (Table 2). There was seasonal correlation ($P < 0.05$) observed among cestodes, nematodes and trematodes but no such correlation was observed for mixed infections ($P > 0.05$).

4. DISCUSSION

In the present study, various species of gastrointestinal helminths were detected in goats studied in Trans Nzoia County in Kenya. Similar findings have been recorded by many researchers in different climatic areas of the tropics [10,14-17] along with other parts of neotropical and temperate the world [1,18,19]. *Fasciola* spp. was the most prevalent GI and belonged to nematode. There are a number of factors that could have influenced the prevalence of gastrointestinal helminths including higher prevalence of trematodes species such as such *Fasciola* spp. These may include grazing habitat and anthelmintics used and the managerial practices [11,20,21]. The higher overall prevalence of GI helminths at 46.1% suggest that goats in the study area are heavily infected with gastro intestinal helminthes which agrees with several studies [12,22-26]. Trematodes (21.6%) prevalence was significantly higher in the study population, which also concurs with the findings other workers in other areas sharing similar climatic conditions with the study area [16,26,27]. There were more diverse groups of nematodes but their prevalence were low, similar findings in other studies elsewhere [21]. The higher prevalence of *Strongyloides* spp could be attributed to its adaptability in a number of climatic conditions such as tropical, subtropical and also temperate climates [28].

In the present study it has been observed that the highest prevalence ($P < 0.05$) of GI helminths was recorded in rainy season. These findings are in consistent with a number of other published reports [29,30]. The higher prevalence of gastrointestinal helminths can be attributed to various favorable climatic conditions, viz., humidity, rainfall, ambient temperature which appears favourable to the growth of helminthes. These help in adequate growth and development of infective larval stages leading to their increased availability in rainy season and its well documented that seasonal pasture contamination and availability of infective larval stages is directly related to gastrointestinal helminthiasis in grazing animals [11]. It can also be attributed to suitable molarities of soil salts which are paramount for ecdysis and is achieved during high rainfall [31].

Relative to age, prevalence of GI helminths was much higher in younger animals ($P < 0.05$) than adults because of their underdeveloped immune system leading to low resistance and high susceptibility in the animals of lower age group (< 3months of age). These observations are in accordance to the findings of several published workers [22,25,28]. Soulsby [31] was of the opinion that previous infections and age of the

Table 1. Prevalence of Gastrointestinal helminthes in goats sampled from Trans Nzoia, Kenya

		Overall		Trematodes		Cestodes		Nematodes		Mixed infection	
Group	**N**	**Infected**	**PR%**	**Infected**	**PR%**	**Infected**	**PR%**	**Infected**	**PR%**	**Infected**	**PR%**
	1392	**642**	**46.1**	**308**	**22.1**	**176**	**12.6**	**158**	**11.4**	**464**	**33.3**
Breed											
Saanen	476	267	56.1	141	29.6	65	13.7	61	12.8	132	9.5
Barbari	233	134	57.5	54	23.2	31	13.3	49	21.0	124	8.9
Galla	532	182	34.2	92	17.3	57	10.7	33	6.2	89	6.4
East African	151	59	39.1	21	13.9	23	15.2	15	9.9	119	8.5
χ^2, *P*-value		**114.321***, <0.0001**		**29.11**, <0.0001**		**66.119*, <0.0001**		**68.553**, <0.0001**		**11.3322*, 0.0003**	
Age											
< 3 months	321	201	62.6	87	27.1	32	10.0	48	15.0	172	12.4
3-9 months	589	217	36.8	131	22.2	82	13.9	56	9.5	162	11.6
>9 months	482	224	46.5	90	18.7	62	12.9	54	11.2	130	9.3
χ^2, *P*-value		**9.76***, 0.0032**		**10.54**, 0.0002**		**4.622*, 0.0023**		**4.134**, 0.0042**		**17.114*, 0.001**	
Season											
Rainy	679	302	44.5	149	21.9	90	13.3	90	13.3	240	17.2
Dry	713	340	47.7	159	22.3	86	12.1	68	9.5	224	16.1
χ^2, *P*-value		**19.22***, <0.0001**		**7.34**, 0.0037**		**6.342*, 0.0032**		**8.234**, 0.0007**		**2.894*, 0.113**	

Table 2. Prevalence of different groups of gastrointestinal helminthes in Trans Nzoia goat

Gastro intestinal helminths	Number positive	Prevalence
Cestodes		
Moniezia expansa	172	12.4
Moniezia benedeni	128	9.2
Total[a]	300	21.6
Trematodes		
Fasciola spp.	213	14.5
Paramphistomum spp.	99	7.1
Total[b]	312	21.6
Nematodes		
Strongyloides spp	71	5.1
Trichostrongylus spp.	36	2.6
Haemonchus spp.	34	2.4
Trichuris spp.	21	1.5
Oesophagostomum spp.	14	1
Bunostomum spp.	11	0.8
Oestertagia spp.	9	0.6
Cooperia spp.	7	0.5
Total[c]	**71**	**5.1**

[a,b,c]*The total exceed the values in table 1 due to occurrence of the species in the mixed infections category*

host animal provides substantial protection against reinfection and therefore, acute disease is most common in younger animals.

5. CONCLUSION

The present study recorded higher prevalence of gastrointestinal helminthiasis in Trans Nzoia goats. Among, these in single infection, helminths, nematodes particular flukes (*Fasciola* spp.) was most prevalent followed by two species of cestodes (*Moniezia expansa* and *Moniezia benedeni*) while most members of nematodes were more in diversity but low in abundance. There were significant differences ($P < 0.05$) in the infections between breeds with Saanen and Barbari having higher prevalence of the GI helminthes. Meanwhile East African had higher prevalence of trematodes, cestodes and nematodes while highest mixed infections occurred in Barbari. Young goats aged < 3 months were heavily infected with all groups of helminthes than the older goats aged > 3 months. In terms of seasonal differences, rainy season had higher prevalence of all groups of GI helminthes except mixed infection than dry seasons.

ETHICAL APPROVAL

This study was done in accordance with ethical guidelines of Maseno University and the National Commission of Science Technology and Innovation guidelines (NACOSTI) Kenya guidelines.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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