A COPROLOGICAL SURVEY ON THE OCCURRENCE OF GASTROINTESTINAL PARASITISM IN GOATS IN KALMUNAI VETERINARY DIVISION

B.Yaminee[1*], N.J.N. Jamaldeen[1] and A.Arulkanthan[2]

[1] Department of Animal Production and Health, Sri Lanka.

[2] Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Sri Lanka.

[*] *yamineevet2711@gmail.com*

ABSTRACT: *Goat farming is one of the main sectors that contribute to the economy of Kalmunai area of the Ampara district. This study was conducted to determine the occurrence of gastrointestinal parasitism in goats from four villages (Neelavanai, Natpaddimunai, Maruthamunai and Pandiruppu) of the Kalmunai Veterinary division. A total of 80 faecal samples were collected and examined for parasitic eggs and coccidian oocysts using simple salt flotation method and McMaster counting technique. Three types of nematode eggs, namely Strongyle, Strongyloides and Trichuris types, and Eimeria oocysts were observed in this study. Of the 80 samples, 59 (73.8%) were positive for either nematode eggs or Eimeria oocysts. There were no differences (P > 0.05) on the occurrence of parasitism between males and females as well as between different age categories. However, the number of animals excreting Strongyle and Strongyloides type eggs was significantly low in goats reared under intensive management system compared with other management systems (P < 0.05). There were no differences in the occurrence of parasitism between the sampled locations (P > 0.05). Female goats had high EPG (eggs per gram of faeces) counts compared with males, but the difference was not significant (P> 0.05). Although not significant, goat kids had slightly high EPG, and the EPG was significantly low (P < 0.05) in goats reared under intensive management system. There were no differences (P > 0.05) in the EPG among the four sampling locations. The parasitic stages excreted by the goats in this study are similar to those recorded from elsewhere in this country. The high parasitism observed in extensively managed goats may be due to the exposure to contaminated pastures in communal lands. A longitudinal study is needed to design a sustainable strategy to control parasitism in goats in the study area.*

Key Words: Goat Industry, Gastrointestinal parasitism, Kalmunai Veterinary Division

1. INTRODUCTION

Goats are distributed all over the world due to their adaptability to varying environmental and nutritional conditions. They become useful to man throughout the ages due to their productivity, small size, and non-competiveness with him for food. They make a very valuable contribution to the rural economy of the developing countries, although they are often neglected when compared to cattle and sheep. Further, it is believed that goats are tolerant to many diseases and parasites compared to sheep. Goat production is an important and viable sub-sector of animal production in Asia including Sri Lanka (Subasinghe, 2016).

The goat population of this country is 266,750 with number of sheep and goat farms are 48,925 (Livestock Planning and Economics Division of the Department of Animal Production and Health, Sri Lanka, 2016). In addition to

the local non-descript breeds, Saanen, Jamnapari and their crosses are the other goat breeds available in Sri Lanka. Goats are mainly kept for the production of meat and milk, and goat farming provide sole or subsidiary source of income to many small holders living mainly in the dry and intermediate zones (Subasinghe, 2016).

Goats are affected by many diseases including those caused by nematodes infecting the gastrointestinal tract (GIT). The epidemiological pattern of GIT nematode infection is influenced by factors related to the host (genetic background, sex, age; and nutritional, immune and physiological status), parasite (dose of infection, virulence, and fecundity) and environment. The GIT nematode eggs are excreted in the faces and they develop into infective larvae in the environment under the influence of temperature, moisture, rainfall, and oxygen availability (Soulsby, 1982). The development of parasitic eggs is impaired by high environmental temperature, while the rainy season provides an ideal condition for the development of eggs into infective larvae in the pasture in the tropical countries. Hence, the prevalence of GIT nematode infection is high in goats just after the rainy reason (Gadahi *et al*., 2009).

The common gastrointestinal nematodes occurring in goats in Sri Lanka are *Haemonchus contortus, Oesophagostomum columbianum, Trichostrongylus colubriformis, Trichostrongylus axei, Strongyloides papillosus* and *Trichuris ovis* (Rajapakse *et al*, 2001). The blood sucking abomasal parasite *Haemonchus contortus* causes anaemia, haemorrhagic gastritis, diarrhoea, emaciation, oedema and loss of production and the *Oesophagostomum* spp. causes pimply gut (Soulsby, 1982). In addition to the above nematodes, intestinal protozoan parasites, namely *Eimeria* spp. and *Cryptosporidium* spp., had also been recorded from Sri Lanka (Fernando, 1957; Noordeen et al., 2000).

Under field conditions mixed infection with many species of gastrointestinal parasites are commonly encountered. The acute parasitism with morbidity and mortality is commonly encountered in goat kids, while the infection is generally subclinical or chronic in adult goats. In addition to the direct losses, gastrointestinal parasitism causes decreased feed intake, decreased digestion and absorption, and interference in mineral and protein metabolism. These patho-physiological alterations results in reduced growth rate, production losses and poor meat quality due to the increased retention of water in muscles (Soulsby, 1982; Hawkins, 1993).

Goat industry is one of the sole or subsidiary income generator for the farming community living in the Kalmunai veterinary division, which is located in the eastern province of Sri Lanka. However, the information on the status of GIT parasitism in goats in the above area is scant. Therefore, this study was done

to determine the occurrence of the gastrointestinal parasitism in goats in the Kalmunai Veterinary division; and to evaluate the factors influence the occurrence of parasitism in the study area.

2. MATERIALS AND METHODS

Study area

Kalmunai is located in the Ampara district, which is part of the dry zone of Sri Lanka with an annual rainfall and temperature range from 1650-1702 mm and 27.3- 33 ºC, respectively. The number of goats and the goat farms in the Kalmunai region is 11,190 and 1470, respectively (www.stastistics.gov.lk). Mostly local and Saanen breeds are reared under either extensive, semi intensive or intensive management system for milk and meat purpose.

Study population

This study was carried out during a two month period from June to July in 2017 and the average temperature during the sampling time was 35.5º- 37ºc. This study was conducted in four villages, namely Neelavanai, Natpaddimunai, Maruthamunai and Pandiruppu, belonging to the Kalmunai Veterinary Range. Eighty goats were randomly selected (20 goats per sampling location) and fresh faecal samples were collected directly from the rectum using surgical gloves. The faecal samples were dispatched to the Veterinary Investigation Centre, Ampara and kept at 4º C until examined. All the laboratory tests were completed within two days of sample collection. Further the sex, age of the goats, and the management system was recorded during the sample collection.

Examination of faecal samples for parasites

The faecal samples were initially subjected to salt floatation technique to identify the helminth eggs and *Eimeria* oocysts on the basis of morphological features (Foreyt, 1999). The positive faecal samples were subjected to the McMaster egg counting technique (Soulsby, 1982) to determine the EPG (eggs per gram of faeces) or OPG (oocysts per gram of faeces).

Statistical analysis

Qualitative data has been analysed by using Chi-square test for independence. The quantitative data was normalised using $\log_{10}$ transformation and analysed using either two sample t-test or one way ANOVA. The level of significance was set at $P<0.05$ and the data was analysed using Minitab software, version 14.

3. RESULTS

Three types of nematodes eggs, namely *Strongyle, Strongyloides* and *Trichuris,* and *Eimeria* spp. oocyst was observed in this study. Of the total of 80 faecal samples examined, 59 (73.8%) were positive for either nematode eggs or *Eimeria* oocysts. Although not statistically significant (*P*> 0.05), the percentage of females positive for nematode eggs was higher than males **(Tables 1 and 2)**. The percentage of goat kids positive for nematode eggs was high compared with other age groups, but the difference was not significant (*P*> 0.05) **(Tables 1 and 3)**. However, the number of animals excreting *Strongyle* and *Strongyloides* type eggs reared under intensive management system was significantly low (*P*< 0.05) compared with animals reared under other management systems **(Table 4)**. Amongst the sampling locations, high percentage of positive goats was observed in Neelavanai (85%) and Natpaddimunai (85%) compare with other locations but the difference was not significant (*P*> 0.05) **(Tables 1 and 5)**.

The EPG counts were high in females compared with males, but the difference was not significant (*P*> 0.05) **(Table 6)**. Although not significant, goat kids had slightly high total EPG count compared to other age groups **(Table 7)**. However, the EPG is significantly low (*P*< 0.05) in goats reared under intensive management system **(Table 8)**. Although the mean EPG from goats in Natpaddimunai had a high value compared to the goats from other locations, the difference was not significant (P > 0.05) **(Table 9)**.

Table 1: *Occurrence of eggs/oocysts in the faeces of goats in relation to age, sex, management and location*

Variable	***No. Examined***	***No. Positive***	***Percentage (%)***	***P value [1]***
Age groups				
Kids	*17*	*15*	*88.2*	*0.218*
Young	*41*	*29*	*70.3*	
Adult	*22*	*14*	*63.6*	
Sex				
Male	*37*	*24*	*64.8*	*0.156*
Female	*43*	*34*	*79.1*	
Management System				
Intensive	*19*	*19*	*48.7*	*0.001*
Semi intensive	*25*	*23*	*92.0*	
Extensive	*16*	*15*	*93.75*	
Location				
Neelavanai	*20*	*17*	*85.0*	*0.461*
Natpaddimunai	*20*	*17*	*85.0*	
Maruthamunai	*20*	*14*	*70.0*	
Pandirupu	*20*	*14*	*70.0*	

[1] Chi-square test

Table 2: *The occurrence of different types parasitic stages in relation to sex of goats*

Type	Number Positive (%)		P value[1]
	Male (n=37)	Female (n=43)	
Strongyle type eggs	24 (64.9)	34 (79.1)	0.156
Strongyloides type eggs	24 (64.9)	34 (79.1)	0.156
Trichuris type eggs	5 (13.5)	8 (18.1)	0.538
Eimeria oocysts	2 (5.4)	1 (2.3)	0.470

[1] *Chi-square test*

Table 3: *The occurrence of parasitism in relation to age groups*

Type	No. Positive (%)			P Value[1]
	Kids (n=17)	Young (n=41)	Adults (n=22)	
Strongyle	15 (88.2)	29 (70.9)	14 (63.6)	0.218
Strongyloides	15 (88.2)	29 (70.9)	14 (63.6)	0.218
Trichuris	4 (23.5)	8 (19.5)	3 (13.6)	0.723
Eimeria	2 (11.8)	4 (9.7)	5 (22.7)	0.349

[1] *Chi-square test*

Table 4: *The occurrence of parasitism in relation to management systems*

Type	No. Positive (%)			P value[1]
	Intensive (n=19)	Semi intensive (n=25)	Extensive (n=16)	
Strongyle	19 (48.7)	23 (92)	15 (93.8)	**0.001**
Strongyloides	19 (48.7)	23 (92)	15 (93.8)	**0.002**
Trichuris	4 (10.3)	9 (36)	9 (12.5)	**0.212**
Eimeria	4 (10.3)	7 (10.3)	3 (18.8)	**0.788**

[1] *Chi-square test*

Table 5: *The occurrence of parasitism in relation to different sampling locations*

Type	No. Positive (%)				P value
	Neelavanai (n=20)	Natpaddimunai (n=20)	Maruthamunai (n=20)	Pandiruppu (n=20)	
Strongyle	17 (85)	17 (85)	14 (70)	14 (70)	0.461
Strongyloides	17 (85)	17 (85)	14 (70)	14 (70)	0.461
Trichuris	7 (35)	6 (30)	3 (15)	3 (15)	0.318
Eimeria	2 (10)	3 (5)	1 (1)	3 (15)	0.711

[1] *Chi-square test*

Table 6: *The variation of EPG/OPG count between the sex of goats*

Type	EPG/OPG (Mean ± SE)		P value[1]
	Male	Female	
Strongyle	*1065 ± 143*	*1236 ± 121*	*0.200*
Strongyloides	*470 ± 69*	*676 ± 69*	*0.121*
Trichuris	*48 ± 20*	*69 ± 24*	*0.525*
Total EPG	*1584 ± 208*	*1998 ± 173*	*0.150*
Eimeria	*10 ± 4.5*	*5 ± 4.5*	*0.476*

[1] *Two sample-t test*; *SE – standard error; EPG – eggs per gram of faeces; OPG – oocysts per gram of faeces; Total EPG – sum of the EPG of Strongyle, Strongyloides and Trichuris type eggs.*

Table 7: *The variation of EPG/OPG between age groups*

Type	EPG/OPG (Mean ± SE)			P value[1]
	Kids	Young	Adult	
Strongyle	*1200 ± 138*	*1193 ± 134*	*1055 ± 200*	*0.293*
Strongyloides	*694 ± 128*	*587 ± 68*	*518 ± 97*	*0.284*
Trichuris	*64 ± 30*	*78 ± 25*	*45 ± 25*	*0.746*
Total EPG	*1959 ± 200*	*1859 ± 200*	*1614 ± 283*	*0.201*
Eimeria	*24 ± 16*	*26 ± 13*	*90 ± 40*	*0.201*

[1]*ANOVA*

Table 8: *The variation of EPG/OPG between management systems*

Type	EPG/OPG (Mean ± SE)			P value[1]
	Intensive	Semi intensive	Extensive	
Strongyle	*703 ± 124*	*1352 ± 126*	*1869 ± 144*	*0.002*
Strongyloides	*348 ± 65*	*79 6± 90*	*750 ± 59*	*0.003*
Trichuris	*28 ± 14*	*128 ± 36*	*62 ± 43*	*0.025*
Total EPG	*1079 ± 183*	*2276 ± 178*	*2681 ± 201*	*0.002*
Eimeria	*25 ± 12*	*68 ± 24*	*56 ± 31*	*0.201*

[1]*ANOVA*

Table 9: *The variation of EPG/OPG between different sampling locations*

Type	EPG/OPG (Mean ± SE)				P value[1]
	Neelavanai	Natpaddimunai	Maruthamunai	Pandiruppu	
Strongyle	*1160 ± 138*	*1375 ± 178*	*1180 ± 199*	*1180 ± 199*	*0.553*
Strongyloides	*565 ± 86*	*735 ± 97*	*735 ± 97*	*565 ± 102*	*0.514*
Trichuris	*126 ± 41*	*105 ± 40*	*105 ± 40*	*45 ± 25*	*0.513*
Total EPG	*1860 ± 201*	*2215 ± 242*	*1840 ± 303*	*1790 ± 284*	*0.522*
Eimeria	*45 ± 21*	*35 ± 19*	*35 ± 19*	*35 ± 20*	*0.580*

[1]*ANOVA, Total EPG – sum of the EPG of Strongyle, Strongyloides and Trichuris type eggs.*

4. DISCUSSION

This study reveals that 73.8% of the goats sampled had shed at least one type *(Strongyle* or *Strongyloides* or *Trichuris*) of nematode eggs or *Eimeria* oocysts. The above types of parasitic stages were also recorded in many parts of this country (Fernando, 1957; Faizal *et al*., 1999; Rajapakse *et al*., 2001). The present study showed that there was no statistical difference in the occurrence of eggs/oocysts and the EPG count in relation to sex. Similar results have been recorded in a study done on the parasitism of sheep in Jaffna (Kandasamy, *et al*. 2013). Another study done in Sri Lanka show that the EPG counts in kids were significantly lower compared to young goats (Faizal, *et al,* 2001). But the present study reveal that EPG count from kids were slightly higher, although not significant, than other age groups. This discrepancy could be related to the sampling time, geographical location of the sampling area, genetic background of the hosts and the sample size.

The present study revealed that there was high occurrence of GIT parasitism in goats reared under extensive management system compared to those animals reared under the intensive management system. This could be related to the high risk of exposure of the extensively managed goats to highly contaminated communal pasture lands. Mixed infection of both nematode eggs and *Eimeria* oocysts were also observed in the present study. Similarly, studies done elsewhere in Sri Lanka record concurrent infection of GIT nematodes and *Eimeria* spp. in goats in the dry zone of Sri Lanka (Faizal *et al*., 1999).The result of this study indicates that, even though subclinical in nature, gastrointestinal parasitism is widely distributed in the goats of Kalmunai veterinary range.

5. CONCLUSION ANDSUGGESTIONS

The present study showed the faecal parasitic stages excreted by the goats in the study area are similar to the stages of parasites recorded from other areas of the country. Further, it appears that the goats managed extensively had significantly high prevalence of GIT parasitism compared to goats reared under other management systems. Further studies on longitudinal in nature are needed to understand the epidemiology of GIT parasitic infection in the study area in order to design a sustainable control strategy. In addition, the farmers should be provided short term training on health management to minimize the occurrence of clinical and sub-clinical parasitism in goats in the study area.

ACKNOWLEDGEMENTS

We acknowledge Dr. A.M. Jiffry, government Veterinary Surgeon, Kalmunai, and Mr. Chandana Lal Bandara, Research Assistant, Veterinary Investigation Centre, Ampara for their assistance in this study.

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