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GASTROINTESTINAL PARASITE INFECTIONS IN SMALL RUMINANTS RELATIVE TO HOST SEX, AGE AND HUSBANDRY SYSTEM UNDER THE GUINEA SAVANNAH VEGETATION

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Abstract: Despite raising animals mostly as scavengers in the guinea savannah zone of Ghana, there is still scanty scientific information on the effects of this system on the health of these animals. A study was conducted to document factors influencing the prevalence rate of gastrointestinal (GIT) parasites and their loads in 500 small ruminants (250 each of sheep and goats). Prevalence rate of about 86% was recorded in small ruminants. Sheep, however, had higher ($P<0.05$) overall GIT parasite burden than goats. In sheep, significantly ($P<0.05$) more females harboured strongyles than males. Similarly, tapeworm and GIT parasites in general, were more prevalent ($P<0.05$) in younger than older sheep. Strongyle population was higher ($P<0.05$) in growers than adults, while *Eimeria* spp populations were higher ($P<0.05$) in lambs and adults than growers. The overall GIT parasite load, however, was higher ($P<0.05$) in lambs than all other age groups. In goats, *Eimeria* spp infections, coinfections of *Strongyloides* spp/*Eimeria* spp, tapeworm/*Emeria* spp, and overall GIT parasite load were much higher ($P<0.05$) in the extensive than the semi-intensive systems of management. The overall parasite population was also higher ($P<0.05$) in growers than adults and kids. Coinfections of tapeworm/ *Strongyloides* spp increased ($P<0.05$) with increasing age. The prevalence rate of GIT parasites in small ruminants is high. However, higher GIT parasite burden was found in sheep than goats. Younger small ruminants and goats kept in the extensive system of management are more prone to GIT parasite infestation than those kept in the semi-intensive system and older ones, respectively.

Key words: Scavenger, gastrointestinal parasite burden, sheep, goat, husbandry system

Introduction

The livestock sub-sector, including fisheries contributed over 700 million USD to Ghana's Gross Domestic Product (GDP) as of the year 2020 *(Statista, 2022)*. Notwithstanding such significant contribution by the sub-sector, meat importation still constitute a major effort towards bridging the widening national meat demand gap *(Asuming-Brempong and Nyantang 2003; Alexandratos and Bruinsma 2012)*. Small ruminants are raised by small-holder farmers mainly for monetary and socioeconomic benefits, such as hide, manure, insurance against crop failure, medium-term savings, means of diversifying investment, and to perform social and cultural functions *(Weyori et al., 2018)*. They have inherent advantages over cattle, including high prolificacy rate, high feed use-efficiency from course roughage, short gestation period, rapid growth rate, high tolerance to diseases and tannins. They are also marketabile within one season *(Terril, 1985; Lebbie, 2004; Peacock, 2005)*.

Despite all these benefits, GIT parasite infection remains the predominant factor affecting small ruminant productivity. Parasitism has a significantly negative impact on the sheep industry *(Mavrot et al., 2015)*. There is a relationship between the prevalence of GIT parasites and the agro-ecological conditions, including quality and quantity of pasture, grazing behaviour of the host, humidity and temperature *(Pal and Qayyum, 1993)*. Tropical countries have been cited as having more favourable ambient conditions for helminth spread, including malnutrition/undernutrition in the host organism *(Mbuh et al., 2008)* and poor environmental hygiene in the *hinterlands (Badran et al., 2012)*, hence the severe and persistent GIT parasites infections reported in these locations *(Mohanta et al., 2007; Zeryehun, 2012)*. This makes helminth diseases a leading challenge to tropical small ruminant production systems *(Kumsa et al., 2011)*. Small ruminants are clinically or sub-clinical infected by gastrointestinal helminths in developing countries. Helminths infection leads to a decline in reproductive and productive performance *(Zeryehun, 2012; Ayaz et al., 2013)* as a consequence of reduction in intake and or inefficient conversion of feed *(Kanyari et al., 2009)*. There is also ineffective utilization of imbibed nutrients, leading to stunted growth *(Terefe et al., 2012)*, and this is manifested as anaemia and even death at heavy loads *(Hassan et al., 2011)*. Additionally, helminths infection deteriorates the animal's defences against infection, rendering it susceptible to other opportunistic infections, and this may culminate into remarkable economic deprivation *(Garedaghi et al., 2011)*.

Despite the problems of gastrointestinal parasite in the tropics *(Zerychum, 2012)*, there is still a general paucity of information on their prevalence in small ruminants under some tropical climatic conditions, including the guinea savannah agro-ecological conditions. The farmers in the guinea savannah zones of Ghana raise their animals mostly extensively, serving as scavengers and grazing on

anything they find *(Adams and Ohene-Yankyera, 2015)*. This situation is likely to worsen the problem of gastrointestinal parasites in the animals, as quality and quantity of pasture have been reported to influence the prevalence of gastrointestinal parasites *(Pal and Qayyum, 1993)*. The objective of the present study, therefore, was to establish the prevalence and load of gastrointestinal parasites in small ruminants in the guinea savannah zone, and to establish if management system, host sex and age have effects on these phenomena in small ruminants.

Materials and Methods

Study area

The present work was carried out at Savelugu in the Savelugu/Nanton municipality of the Northern region (Ghana; latitude 9º 40' N and longitude 0º 49' W). The rainy season begins in April in an erratic pattern , and intensify with advancing season. The annal rainfall amounts raises from an average of 600 mm at the beginning of the season to 1 000 mm by the close of the season in October. Savelugu has an average temperature of 34°C. Minimum temperatures occur from December to February due to the North-East Trade winds *(Nyadzi, 2016)*. The district is located in the Savannah woodland, and could support commercial livestock rearing and cultivation of arable crops. The trees found in the area include *Vitellaria paradoxa* and *Parkia biglobosa*, which are drought resistant and are mostly of economic importance.

Experimental animals and management

Two hundred and fifty each of sheep and goats were randomly sampled and used for the study. In each species, 90 kids/lambs (3months old), and 80 each of growers (3-12 months) and adults (above 12 months) were involved. Similarly, in each species, 125 each of males and females were used. Also, 125 each were raised under the extensive and semi-intensive systems of management, respectively.

Both species (sheep and goats) under semi-intensive management system are housed in a pen made of wood and roofed with thatch. Animals are sent out for grazing at 7 am each morning and return at 5 pm. Their diets are supplemented with farms residues and mineral sources (e.g. salt lick). Animals are periodically vaccinated against *peste des petits* ruminants and breeding is controlled.

The sheep and goats under the extensive system have virtually no attention given them. Neither housing nor medication and supplementary feed are provided.

They are left to scavenge for food and water. Ages of the animals were estimated using their dentition *(Rahman and Hossain, 1997).*

Sample collection

Animals were adequately restrained, and faeces hygienically collected from the rectum by gloved hands. The faecal samples obtained were kept in an airtight, clean faecal sample vial, and transported to the laboratory for morphological analysis of helminths eggs. About 5-10 g of faeces were collected from each animal and were labelled with identification numbers, species, locality, sex and age of the animal. Samples were subsequently refrigerated at 4 °C until analysis at the laboratory *(Hayat and Akhtar, 2000)*. The University for Development Studies institutional Review board scrutinised and approved all procedures used.

Faecal analysis

Faecal samples were e xamined by standard direct and indirect parasitological techniques (flotation and sedimentation) *(Soulsby 1982; Hayat and Akhtar, 2000)*. About 3 g of the faecal sample was homogenised in 3 ml distilled water. The emulsion was centrifuged at 3000 rpm for 3 minutes. The supernatant was poured out leaving the sediment. Five millilitres NaCl solution was then added and centrifuged to enable the eggs float. A sample was then pipetted from the surface of the supernatant on to the McMaster counting chamber, and was examined under ×10 magnification.

Identification of helminths eggs and faecal ova counting technique were based on their characteristic morphological features *(Soulsby 1982; Rahman et al., 1996)*. Following faecal analysis, samples were preserved in 10% formalin for backup purposes.

Data analysis

The effects of species of animal, age, sex and management system on GIT parasites prevalence in Djallonke sheep and goats were determined using the chi square procedure. Data on worm load were scrutinised for homogeneity and normality of variance using the Shapiro-Wilk's W and Levene's tests, respectively. Variances were not homogenous, and therefore, the effects of the aforementioned factors on worm load were determined using Kruskal-Wallis test/ Mann Whitney U test. The level of significance for all comparisons was 5%.

Prevalence rate for a particular internal parasite was estimated as the percentage of the animals carrying the particular parasite to the total population of the animals inspected for the parasite during the study period (number of animals carrying the particular internal parasite/total population of animals inspected for the

internal parasite * 100) (CDC web Archive; https://www.cdc.gov /csels/ dsepd/ ss1978/lesson3/section2.html)

Results

Most (86%) of the small ruminants studied were infected with GIT parasites. No significant difference (P>0.05) was found between sheep and goats in the prevalence of GIT parasites. However, sheep was more heavily infested (P<0.05) with *Eimeria* spp and a multiple infection of *Eimeria* spp and *Strongyloides* spp than goats. Similarly overall GIT parasites load was higher (P<0.05) in sheep than goats (Table 1). *Strongylus* spp were more prevalent in female (80%) than in male (53%) sheep.

Table 1. Differences between sheep and goats in internal parasite load and prevalence

Eggs per gram of faeces (epg) (Median (Interquartile range) of the various species of GIT parasites in sheep and goats									
	N° Examined	**S. spp**	**Tpw**	**E. spp**	**SxT**	**SxE**	**TxE**	Overall	Prevalence rate (%)
Sheep	250	500 (200-800)	400 (200-850)	600 (325-1050)	1300 (335-1900)	1250 (950-1800)	1650 (1075-2225)	1800 (800-2900)	53
Goats	250	400 (200-500)	200 (200-400)	400 (200-600)	800 (700-800)	800 (600-900)	1000 (600-1000)	1400 (300-1800)	50
P-Value		0.08	0.065	0.034	0.141	<0.001	0.629	<0.001	0.274

S. spp: *Strongyloides* spp; **Tpw**: Tapeworm; **E. spp**: *Eimeria* spp; **SxT**: multiple infections of *Strongyloides* spp and tapeworm; SxE: multiple infections of *Strongyloides* spp and *Eimeria* spp; TxE: multiple infections of tapeworm and *Eimeria* spp.

No differences were, however, found between males and females in the prevalence rate of all other GIT parasites studied. Similarly, no difference was found between the semi-intensive and extensive management systems in the prevalence rate of all species of parasites studied. The overall prevalence rate did also not differ (P>0.05) between the two management systems. Tapeworms were more prevalent (P<0.05) in lambs (55%) than both growers (25%) and adults (15%). Also, the prevalence rate in growers was higher than in adults. Similarly, the overall prevalence of GIT parasites irrespective of species was highest (P<0.05) in lambs (100%) followed by growers and then adults. No differences were found among the various age groups in the prevalence rates of *Strongyloides* spp, *Eimeiria* spp, multiple infections with strongyles spp and tapeworm, and *Strongyloides* spp and *Eimeiria* spp. Similarly, incidence of all 3 parasites combined was not found in any sheep (table 2).

Table 2. Effects of sex, management and age on prevalence rate of GIT parasites in Djallonke sheep

					Prevalence rates (%) of the various species of GIT parasites														
Parameter	**N° examined**	**S. spp**	**X^2**	**P-value**	**Tpw**	**X^2**	**P-value**	**E. spp**	**X^2**	**P-value**	**SxT**	**X^2**	**P-value**	**SxE**	**X^2**	**P-value**	**overall**	**X^2**	**P-value**
Sex																			
Female	125	100(80)	3.675	0.028	31(25)	1.232	0.267	59(47.2)	0	1.000	21(17)	0.104	0.747	50(40)	0.293	0.588	108(86.4)	0	1.000
Male	125	65(52)			51(41)			59(47.2)			25(20)			38(30.4)			112(90)		
Management																			
Semi-intensive	125	78(62.4)	0.075	0.784	41(33)	0	1.000	47(37.6)	1.674	0.196	25(20)	0.104	0.747	34(27.2)	1.172	0.279	100(80)	2.588	0.108
Extensive	125	87(70)			41(33)			71(57)			21(17)			54(43.2)			120(96)		
Age group																			
Lambs	90	67(74.4)	1.950	0.377	50(55.6)	8.010	0.018	50(55.6)	0.937	0.626	30(33.3)	5.625	0.060	36(40)	0.440	0.803	90(100)	6.146	0.046
Growers	80	55(69)			20(25)			32(40)			14(17.5)			28(35)			71(89)		
Adults	80	43(54)			12(15)			36(45)			2(5)			24(30)			59(74)		

S. spp: *Strongyloides* spp; **Tpw**: Tapeworm; **E. spp**: *Eimeria* spp; **SxT**: multiple infections of *Strongyloides* spp and tapeworm; SxE: multiple infections of *Strongyloides* spp and *Eimeria* spp

Table 3. Effects of sex, management and age on GIT parasite load in Djallonke sheep

Eggs per gram of faeces (epg) (Median (Interquartile range)) of GIT parasite loads in sheep													
Parameter	**N° Examined**	**S. spp**	**P-value**	**Tpw**	**P-value**	**E. spp**	**P-value**	**SxT**	**P-value**	**SxE**	**P-value**	**overall**	**P-value**
Sex													
Male	125	500 (300-825)	0.608	700 (450-1100)	0.040	600 (400-950)	0.616	1600 (1150-2025)	0.668	1350 (1150-1850)	0.395	800 (400-1250)	0.080
Female	125	400 (200-725)		300 (175-525)		400 (250-1000)		1150 (850-1150)		1050 (775-1775)		500 (200-1100)	
Management													
Semi-intensive	125	400 (250-550)	0.045	600 (250-875)	0.563	400 (300-750)	0.423	1150 (775-1300)	0.198	1050 (700-1425)	0.153	600 (300-900)	0.564
Extensive	125	800 (200-1100)		400 (200-400)		700 (400-1100)		1900 (1075-2075)		1450 (1050-2025)		800 (400-1350)	
Age group													
Lambs	90	500 (500-750)^{ab}	0.016	800 (300-1000)a	0.034	900 (500-1100)^{a}	0.015	1600 (1075-1900)	0.681	1300 (900-1900)	0.823	850 (400-1225)a	0.043
Growers	80	550 (300-1175)^{a}		400 (400-500)b		250 (125-400)^{b}		1300 (1000-1950)		1500 (950-1850)		550 (300-1225)b	
Adults	80	300 (150-550)^{b}		100 (100-250)c		700 (400-800)^{a}		800 (800-805)		1150 (1025-1350)		550(300-800)b	

S. spp: *Strongyloides* spp; **Tpw**: Tapeworm; **E. spp**: *Eimeria* spp; **SxT**: multiple infections of *Strongyloides* spp and tapeworm; SxE: multiple infections of *Strongyloides* spp and *Eimeria* spp;

Median (interquartile range) within a column and group having no superscript in common are significantly different (P<0.05).

The effects of sex, management system and age on faecal egg count (FEC) in Djallonke sheep are shown in Table 3.

No differences (P>0.05) were found between males and females in the populations of the various GIT parasites studied except tape worm, whose count was much higher in males than females. Overall GIT parasites loads were also not different between the two sexes. Similarly, the two management systems did not differ (P>0.05) in the populations of *Eimeiria* spp, Tapeworm eggs and mixed infections. Strongyles egg count was, however, higher in sheep raised in the extensive system than those raised in the semi-intensive system. Strongyles population was also much higher (P<0.05) in growers than in adults. Even though strongyles egg count tended to be higher in lambs than in adults, the differences were not statistically significant (P>0.05). Tapeworm epg was significantly (P<0.05) higher in lambs than both growers and adults. Similarly, FEC for Tapeworm was higher (P<0.05) in growers than adults. Lambs harboured the most (P<0.05 *Eimeiria* spp, followed by adults and then growers. The difference in epg for *Eimeiria* spp between lambs and adults was not statistically significant (P>0.05). The overall worm load was higher (P<0.05) in lambs than all other age groups. The populations of combinations of either *Strongyloides* spp and tapeworm or strongyles and *Eimeiria* spp in individuals did not differ between various age groups.

The prevalence rates of the various species of worms in goats are shown in Table 4. No difference was noticed between males and females in the prevalence rates of any of the GIT parasites studied. The prevalence rates irrespective of species of worm involved were also similar (P>0.05) in both sexes. Similarly, goats under the two management systems were infected at the same rate by the various species of GIT parasites considered. Age of goats did not also influence (P>0.05) the prevalence of the various species of internal parasites, neither did it influence the overall prevalence rate of all GIT parasites.

Male and female goats were equally infested with all the species of GIT parasites studied (Table 5). Goats raised under the extensive system of management, however, were more heavily infested with *Eimeiria* spp, a combination of *Eimeiria* spp and *Strongyloides* spp or *Eimeiria* spp and tapeworms in multiple infections than those raised under the semi-intensive system. Also, overall parasite load was much higher (P<0.05) in extensively raised animals than semi-intensively raised animals (Table 5). Age had no influence (P>0.05) on populations of the various species of internal parasites that infested goats. However, epg in multiple infections of *Eimeiria* spp and tapeworm significantly (P<0.05) increased with increasing age. GIT parasite load irrespective of species of parasite involved was also much higher (P<0.05) in growers than both kids and adults (Table 5).

Table 4. Effects of sex, management and age on prevalence rate of GIT parasites in Djallonke goats

		Prevalence rate(%) of the various species of GIT parasites																	
parameter	**N° examined**	**S. spp**	**X^2**	**P-value**	**Tpw**	**X^2**	**P-value**	**E. spp**	**X^2**	**P-value**	**S xT**	**X^2**	**P-value**	**S x E**	**X^2**	**P-value**	**overall**	**X^2**	**P-value**
Sex																			
Female	125	63(50.4)	0.000	1.000	41(33)	0.328	0.567	103(82.4)	2.131	0.144	9(7.2)	0.000	1.000	54(43.2)	0.069	0.792	113(90.4)	1.080	0.299
Male	125	63(50.4)			29(23.2)			79(63.2)			13(10.4)			46(37)			96(77)		
Management																			
Semi-intensive	125	60(48)	0.070	0.796	29(23.2)	0.328	0.567	91(73)	0.000	1.000	9(7.2)	0.000	1.000	50(40)	0.000	1.000	100(80)	0.120	0.729
Extensive	125	66(53)			41(33)			91(73)			13(10.4)			50(40)			109(87.2)		
Age group																			
Kids	90	50(55)	0.400	0.819	22(24.4)	0.657	0.720	65(72.2)	0.170	0.918	9(10)	0.436	0.804	40(44.4)	0.417	0.812	77(85.6)	0.240	0.887
Growers	80	36(45)			28(35)			58(72.5)			5(6.3)			32(40)			64(80)		
Adults	80	40(50)			20(25)			59(74)			8(10)			28(35)			68(85)		

S. spp: *Strongyloides* spp; **Tpw**: Tapeworm; **E. spp**: *Eimeria* spp; **SxT**: multiple infections of *Strongyloides* spp and tapeworm; SxE: multiple infections of *Strongyloides* spp and *Eimeria* spp;

Table 5. Effects of sex, management and age on GIT parasite load in Djallonke goats

Egg per gram of faeces (epg) (Median (Interquartile range)) of the various species of GIT parasites in goats													
Parameter	**N° Examined**	**S. spp**	**p-value**	**Tpw**	**p-value**	**E. spp**	**p-value**	**SxE**	**P-value**	**TxE**	**P-value**	**overall**	**P-value**
Sex													
Male	125	400 (200-550)	0.389	200 (200-275)	0.212	400 (200-600)	0.858	800 (700-950)	0.065	800 (450-1000)	0.590	400 (200-800)	0.931
Female	125	300 (200-400)		400 (200-500)		400 (225-550		600 (400-825)		1000 (850-1000)		400 (200-700)	
Management													
Semi-intensive	125	250 (125-400)	0.294	200 (150-300)	0.516	300 (200-400)	0.015	600 (400-800)	0.048	650 (525-775)	0.042	400 (200-600) 0.026	0.001
Extensive	125	400 (275-525)		250 (200-400)		450 (300-775)		800 (700-975)		1000 (850-1000)		550 (300-800)	
Age group													
Kids	90	300 (200-400)	0.284	100 (100-200)	0.265	400 (200-500)	0.173	700 (600-800)	0.085	1000 (700-1100)[a]	0.049	400 (200-725)[b] 0.018	0.001
Growers	80	500 (400-700)		300 (200-350)		500 (250-800)		900 (800-1100)		650 (625-675)[b]		600 (300-900)[a]	
Adults	80	300 (200-400)		300 (200-400)		300 (225-400)		700 (400-800)		300 (10-350)[c]		350 (200-600)[b]	

S. spp: *Strongyloides* spp; **Tpw**: Tapeworm; **E. spp**: *Eimeria* spp; SxE: multiple infections of *Strongyloides* spp and *Eimeria* spp; TxE: multiple infections of tapeworm and *Eimeiria* spp

Median (interquartile range) within a column and group having no superscript in common are significantly different (P<0.05).

Discussion

The prevalence of GIT parasites of 86% observed among small ruminants in this study agrees with the report of *Emiru et al. (2013)* in Genchi district of Ethiopia. These were higher than the 56% reported by *Petros and Lakew (2014)* in Quarit (Ethiopia) and 56.77% reported by *Fayisa et al. (2020)* in North Western Ethiopia. Similar prevalence rates were found in sheep and goats in the present study. Even though sheep tended to have higher rate of prevalence than goats, the difference was not statistically significant. This is in line with the observation of *Getchew (1998)* in Mekele (Ethiopia). In contrast to these observations, other studies *(Arafa et al., 2007; Ibrahim et al., 2008)* reported higher prevalence in sheep compared to goats, and concluded that the former were more susceptible to GIT parasites infection than the latter. A possible reason for this observation is that goats derive about 60% of their diet from browsing tall forages, compared to sheep that graze closely to the ground. This predisposes sheep more to worm infestation than goats *(Walker, 1994)*. It is, therefore, not surprising that sheep had significantly higher overall GIT parasite load than goats in the present study. In both species, however, the GIT parasite burden fall within the very high intensity range, a median of 1800 epg in sheep and 1400 epg in goats. The implication is that small ruminants within the guinea Savannah vegetation are heavily infested with GIT parasites, even though sheep is at a higher risk than goats.

The insignificant influence of sex on prevalence rate of GIT parasites in both sheep and goats in the present study is similar to the reports of several studies *(Armour 1980; Getachew 1998; Fikru et al., 2006; Tefera et al., 2009).* In contrast to these findings, other studies *(Thrusfield, 2005; Bashir et al., 2012; Fayisa et al., 2020)* reported higher prevalence rates in females than males. The authors attributed their findings to the temporary loss of naturally acquired immunity to GIT parasites which occurs in females during the periparturient period *(Schoenian, 2012)*, as most of the ewes used were in periparturient state. In the present study, Strongyles were found to be more prevalent among female sheep than males. Similarly, *Ibrahim et al. (2014)* reported higher prevalence of *Paramphistomum* and *Haemonchus* in females than males.

Similar to the observation of the present study in sheep, *Fikru et al. (2006)* reported that young animals were more susceptible to GIT parasites infection than older animals. In both sheep and goats, higher overall epg were recorded in younger than older animals. Also, tapeworms were more prevalent in younger than older sheep. In this species, growers had also higher strongyle epg than any other age group. Similarly, lambs had more *Eimeria* spp than any other age group. These results may be linked to immunological maturity attained as the animals age, and increase in acquired immunity due to repeated exposure *(Chiejina, 1986)*. Contrary to these findings, other studies *(Fritsch et al., 1993; Waruiru et al., 2005)* reported

that sheep of all age groups were equally infected by GIT parasites. In goats, *Schoenian (2012)* reported that kids were more susceptible to coccids than any other age group. In contrast, the results of this study demonstrated that all age groups of goat were equally susceptible to all GIT parasite species studied, including coccids.

The higher GIT parasite loads recorded in extensively raised goats compared to semi-intensively raised goats in the present study is not surprising, as animals were largely left to fend for themselves in the extensive system, feeding on anything *(Ockling, 1987)*, and poor pasture conditions have been implicated in worm infestations in these animals *(Ockling, 1987)*. Similarly, *Notifor et al. (2013)* reported higher GIT parasite burdens in tethered and free ranging animals. The insignificant effect of management on parasite loads and prevalence in sheep reported in the present study is expected, since both extensive and semi intensively raised animals in the study location were raised on communal pasture during the study period. This period coincided with the end of the dry season when paddocks for the semi intensively raised sheep were mostly dried up, and could not support grazing. Unlike in sheep, goats under semi-intensive systems were heavily supplemented with browse, and may have ingested far less worm eggs compared to their extensively raised counterparts.

Conclusion

The prevalence rate and loads of GIT parasites are very high in small ruminants under guinea savannah conditions, but sheep was more heavily infested than goats. In goats, sex and management system had no influence on prevalence rate and population of any of the species of GIT parasites studied. Young goats, however, had higher parasite burden than older goats. In sheep, *Strongylus* spp were more prevalent in females than males. Also, younger sheep were more susceptible to tapeworms in particular, and GIT parasites in general than older sheep. Sheep kept under the extensive system of management are also more prone to worm infestation than those raised under the semi-intensive system. The practice of grazing animals of different ages and species together should be reduced in order to reduce cross infestations. Also, during rainy seasons where climatic factors are favourable for survival and development of parasitic stage of helminths, animals should not be sent out for grazing before sunrise. Animals, particularly sheep, must be heavily supplemented during the dry season in order to decrease the degree of exposure to parasite eggs.

Gastrointestinalne parazitske infekcije kod malih preživara različitog pola, uzrasta i sistema uzgoja u uslovima vegetacije gvinejske savane

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Rezime

Uprkos tome što se životinje uzgajaju uglavnom kao svaštojedi u zoni gvinejske savane u Gani, još uvek postoje oskudne naučne informacije o efektima ovog sistema na zdravlje ovih životinja. Sprovedeno je istraživanje kako bi se dokumentovali faktori koji utiču na stopu prevalencije gastrointestinalnih (GIT) parazita i njihovog opterećenja kod 500 malih preživara (po 250 ovaca i koza). Stopa prevalencije od oko 86% zabeležena je kod malih preživara. Ovce su, međutim, imale veće ($P<0,05$) ukupno opterećenje GIT parazitima od koza. Kod ovaca, značajno ($P<0,05$) više ženskih grla imalo je prisustvo oblih/valjkastih crva nego muška grla. Slično, pantljičara i paraziti GIT uopšte, bili su češći ($P<0,05$) kod mlađih od starijih ovaca. Populacija oblih/valjkastih crva je bila veća ($P<0,05$) kod grla u porastu nego kod odraslih, dok je populacija *Eimeria* spp bila veća ($P<0,05$) kod jagnjadi i odraslih grla, u poređenju sa jedinkama u porastu. Međutim, ukupno opterećenje GIT parazitima bilo je veće ($P<0,05$) kod jagnjadi nego u svim drugim starosnim grupama. Kod koza, infekcije *Eimeria* spp, koinfekcije *Strongyloides* spp/*Eimeria* spp, pantljičara/*Emeria* spp i ukupno opterećenje GIT parazitima bili su mnogo veći ($P<0,05$) u ekstenzivnim nego poluintenzivnim sistemima uzgoja. Ukupna populacija parazita je takođe bila viša ($P<0,05$) kod grla u porastu nego kod odraslih i jaradi. Koinfekcije pantljičare/ *Strongyloides* spp su se povećavale ($P<0,05$) sa povećanjem starosti. Stopa prevalencije GIT parazita kod malih preživara je visoka. Međutim, veće opterećenje GIT parazitima nađeno je kod ovaca nego kod koza. Mlađi mali preživari koji se drže u ekstenzivnom sistemu skloniji su infestaciji GIT parazitima od onih koji se drže u poluintenzivnom sistemu i starijih koza, respektivno.

Ključne reči: svaštojedi, opterećenje gastrointestinalnim parazitima, ovce, koze, sistem uzgoja

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Conflicts of interest
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