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Helminths of Sheep and Goats in Central Oromia (Ethiopia) During the Dry Season

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Abstract: A cross-sectional study was conducted to determine the prevalence and identity of parasites of sheep and goats in and around Bishoftu during the dry season from November 2007 to April 2008. For this purpose, a total of 222 faecal samples were collected from small ruminants (157 sheep and 65 goats), all kept under an extensive management system. Flotation, sedimentation and coprocultures were employed to identify helminths. Out of the total, 222 faecal samples examined 81.5% (181) were found to harbor one or more genera of parasites. About 70.2% (156) of the examined small ruminants were positive for helminths while 46.4% (103) of them were positive for Eimeria oocysts. The results of the study showed that 81% (128) of the sheep and 83% (54) of the goats were found to harbor one or more genera of parasites. Overall, 11 genera of helminths were identified in sheep whereas, 8 helminth genera were identified in goats. On coproculture of positive samples, the genera of helminths in decreasing order of prevalence in sheep were *Trichostrongylus/Teladorsagia*, *Haemonchus*, *Oesophagostomum*, *Strongyloides* and *Bunostomum* sp. Likewise in goats, the prevalence of genera of helminths in decreasing order was *Trichostrongylus/Teladorsagia*, *Haemonchus*, *Oesophagostomum*, *Bunostomum* and *Strongyloides* sp., *Trichostrongylus/Teladorsagia*, *Haemonchus* and *Oesophagostomum* were identified as the most prevalent genera of nematodes in both hosts. In the study area where nutrition is generally poor during the dry season poor productivity in small ruminants is likely to be aggravated by a high prevalence of polyparasitism.

Key words: Helminths, goats, sheep, prevalence, dry season, bishoftu, central oromia, Ethiopia

INTRODUCTION

Ethiopia has a high population of 23.6 million sheep and 23.3 million goats but productivity is generally low due to diseases, malnutrition and other management problems (Haileleul, 2002). Helminthosis is one of the important parasitic diseases contributing to losses in productivity (Agyei, 2003; Odoi *et al*., 2007).

Worldwide, parasitic helminths are a major cause of losses in productivity and health problems of goats and sheep and are usually associated with huge economic losses especially in resource poor regions of the world (Cernanska *et al*., 2005). Parasitic helminths also cause immunosuppression and as a result enhance susceptibility to other diseases (Kumba *et al*., 2003; Torina *et al*., 2004; Githigia *et al*., 2005).

The problem is much more severe in tropical countries due to very favorable environmental conditions for parasite transmission, poor nutrition of host animals and poor sanitation in facilities where animals are housed. As a result diseases caused by helminths remain one of the major impediments to small ruminant production in the tropics (Maichomo *et al*., 2004; Kumsa and Abebe, 2009). In the tropics, up to 95% of sheep and goats are reported to be infected with helminths of which Haemonchus and Trichostrongylus are the two most commonly involved genera (Opara *et al*., 2005; Odoi *et al*., 2007; Mbuh *et al*., 2008). However, the majority of the animals infected with helminths do not show clinical signs owing to the chronic nature of the disease. Sub-clinical helminthosis is considered the most common form of infection and cause of economic losses.

In Ethiopia, helminthosis is responsible for 25% mortality and 3.8% weight loss in highland sheep and causes an estimated annual loss of about 700 million Ethiopian birr (Haileleul, 2002). Helminthosis is associated

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with enormous losses due to condemnation of affected organs at slaughter (Kumsa and Wossene, 2006). Several previous studies conducted in different parts of Ethiopia have revealed that the most common genera of parasitic nematodes of small ruminants are: Haemonchus, Trichostrongylus, Oesophagostomum, Bunostomum, Strongyloides and Trichuris (Haileleul, 2002; Fikru *et al*., 2006; Kumsa and Wossene, 2006; Bersissa and Ajebu, 2008). However, no study has been conducted on parasitic fauna of small ruminants in the current study area. Therefore, a study was designed to investigate the prevalence and composition of helminths of small ruminants in and around Bishoftu town in central Oromia Regional state in Ethiopia that may help to devise effective control measures against the parasites of small ruminants.

MATERIALS AND METHODS

Study area: The study was carried out in and around Bishoftu town in Oromia Regional state. Bishoftu is located at 47 km East of Addis Ababa at an altitude of 1900 m above sea level. Geographically Bishoftu lies at 08°44'N and 38°58'E. Bishoftu town is located on the escarpment of the Great Rift valley. The topography of the area is marked by the presence of a number of crater lakes. These lakes and the position of the town on the escarpment of the Great Rift valley influence the climate of the area and the life of the people in the vicinity. The area experiences a bimodal rainfall pattern with a short rainy season from March to May and a long rainy season from June to September. The area has a mean annual rainfall of 850 mm and a mean annual temperature of 172°C. The farmers in the area practice mixed crop-livestock type of farming. The area has large population of donkeys, horses mules, ruminants and poultry.

Study animals: The study was carried out from November 2007 to April 2008 on naturally infected sheep and goats of indigenous breeds that are kept under the traditional extensive management system. All sheep and goats were owned by smallholder resource poor farmers. In the study area, ruminants are managed by communal holding of all species such as cattle, sheep, goats and equines which graze on areas of natural pasture. A total of 222 (157 sheep and 65 goats) were examined over the study period. Study sheep and goats were categorized into two age groups as young animals of <1 year and adults of >1 year of age. Age and sex of the study sheep and goats were recorded during sampling.

Sample collection and examination: Fecal samples were collected directly from the rectum of each study animal. The collected samples were labeled and placed in cool boxes and transported for examination to the laboratory of parasitology of the Faculty of Veterinary Medicine located at Bishoftu town. The presence of ova of nematodes and oocysts of *Eimeria* sp. was determined by simple flotation technique using saturated sodium chloride as the flotation solution. A sedimentation technique similar to the method used by Kumsa and Abebe (2009) was employed to detect the presence of the eggs of trematodes. For the presence of larvae of lungworms a modified Baermann method previously described by Kumsa and Abebe (2009) was used.

Coproculture and L_3 identification: Positive faecal samples for strongyle eggs from animals of the same age, sex and species were pooled and cultured for larval identification. Approximately 5 g faeces from each study animal were pooled for each category and incubated at 27°C for 7 days. The L_3 were recovered using the Baermann technique. Then the L_3 were counted and identified using the key morphological features described by Van Wyk *et al.* (2004). Where possible 100 L_3 were identified per category if <100 L_3 were available then all were identified.

Data analysis: Data were entered into the Microsoft Excel program and then imported into SPSS, 2002 for windows for analysis. Analysis of basic descriptive statistics, cross-tabulations and Chi-square (χ^2) test were performed using this software. The proportion of sheep and goats excreting eggs or oocysts of parasites in the faeces by month, age and sex was analyzed using Pearson's Chi-square (χ^2) test. The presence of a significant difference was considered when $p \leq 0.05$.

RESULTS AND DISCUSSION

Out of the total 222 (157 sheep and 65 goats) small ruminants examined over the study period, 81.5% (181) were found to harbor one or more parasite species. One hundred and fifty six (70.2%) of the examined small ruminants were positive for helminths while 102 (49.6%) of them were positive for Eimeria oocysts.

Total 81% of the sheep and 83% (54) of the goats studied were found to harbor one or more parasite species (Table 1). The distribution of different classes of helminths included nematodes followed by cestodes and trematodes in both host species. The prevalence of

Table 1: Overall prevalence of helminths and *Eimeria* sp. in sheep and goats in and around Bishoftu

	No. of sheep		No. of goats		Overall number	
Types of helminths	Examined	Infected	Examined	Infected	Examined	Infected
Nematodes	157	135 (86.0%)	65	54 (83.1%)	222	189 (85.1%)
Cestodes	157	20 (12.7%)	65	19 (29.2%)	222	39 (17.6%)
Trematodes	157	1 (0.6%)	65	0 (0.0%)	222	1 (0.4%)
Eimeria sp.	157	78 (49.7%)	65	25 (38.5%)	222	103 (46.4%)

Table 2: Prevalence of different helminths eggs in sheep and goats of the study area

Parasite types	Sheep	Goats
Strongyle type eggs	89 (56.60%)	40 (61.0%)
Moniezia sp.	20 (13.00%)	19 (29.2%)
Strongyloides sp	13 (8.205)	10 (15.4%)
Skrjabinema ovis	20 (13.00%)	4 (6.1%)
Trichuris sp.	8 (5.00%)	0 (0.0%)
D. filarial larvae	5 (3.105)	0 (0.0%)
Fasciola sp.	1 (0.63%)	0 (0.0%)
	-	0 (0.0%)

Table 3: Overall prevalence of *Moniezia* sp. in different ages and sexes of sheep and goats in the study area

Variables	No. of positive	χ^2	p value
Species			
Sheep	20	8.63	0.003
Goat	19		
Age			
Young	30	28.67	0.001
Adult	9		
Sex			
Female	15	10.36	0.001
Male	24		

Table 4: Overall percentage of genera of nematodes identified from coprocultures in sheep and goats of the study area

Genera of nematodes	Sheep (%)	Goats (%)
Trichostrongylus/Teladorsagia sp.	46.7	40.3
Haemonchus sp.	34.9	39.4
Oesophagostomun sp.	16.8	16.7
Strongyloides sp.	0.9	3.0
Bunostomum sp.	0.7	0.6

nematodes was significantly ($p<0.05$) higher than that of cestodes, trematodes and *Eimeria* sp. in both host species. In the sheep, the genera of helminths detected were strongyle type nematodes, *Moniezia* sp., *Strongyloides* sp., *Trichuris* sp., *Skrjabinema ovis*, *Dictyocaulus filaria* and *Fasciola* sp. Likewise in goats, the genera of helminths detected were strongyle type nematodes, *Moniezia* sp., *Strongyloides* sp. and *Skrijabinema ovis*. Eggs of *Trichuris* sp. and *Fasciola* sp. and larvae of lungworms were never detected in the goats. The types of helminth parasites encountered in sheep and goats are shown in Table 2. A significantly ($p<0.05$) higher prevalence of strongyle type eggs than the other types of helminths was recorded in both host species. A significantly higher prevalence of *Moniezia* sp. was observed in the sheep ($\chi^2 = 8.63$, $p = 0.003$) than in the goats, in the lambs and kids ($\chi^2 = 8.67$, $p = 0.001$) than in the adults and in the males ($\chi^2 = 10.36$, $p = 0.001$) than in the females in both sheep and goats (Table 3). However, statistically significant associations were never observed ($p>0.05$) between the prevalence of other parasites and these factors in either host species.

The results of coprocultures revealed the presence of *Trichostrongylus/Teladorsagia* sp., *Haemonchus* sp., *Oesophagostumum*, *Strongyloides* and *Bunostomum* sp. in both sheep and goats of the study area (Table 4). Irrespective of age and sex in both host sp., *Trichostrongylus/Teladorsagia* sp., *Haemonchus* sp. and *Oesophagostomum* sp. were identified as the most predominant genera of helminths in the study area.

The results of the faecal examination revealed a high overall prevalence (81% in sheep and 83% in goats) of helminths in both host species during the dry season of the year suggesting that they are a major health and productivity problem of small ruminants in the area. This is most probably attributed to the fact that sheep and goats of the study area are managed under an extensive traditional system in which the animals graze on natural pasture during all the months of the year, their nutritional status is probably inadequate and there is a lack of modern animal health care in the study area. The overall prevalence reported in the current study is comparable to the earlier report from Ethiopia (Fikru *et al*., 2006) and elsewhere in the world (Ng'anga *et al*., 2004; Opara *et al*., 2005; Waruru *et al*., 2005; Raza *et al*., 2007). However, the overall prevalence of parasitic helminths recorded in the current study was lower than that reported earlier 92% in sheep and goats by Kumsa and Wossene (2006) from Ogaden region and 100% in sheep by Bersissa and Ajebu (2008) from Hawassa and 100% in sheep by Kumsa from Hawassa and its surroundings. The low overall prevalence recorded in the current study during the period from November 2007 to April 2008 is attributed to unfavorable temperature and rainfall for the survival and development of the free living stages of helminths on pasture during the study period. Kumsa and Wossene (2006) reported that infective larvae of nematodes of sheep failed to develop to the L_3 stage during the dry season from November to May in a tropical environment in eastern Ethiopia. In addition, a variety of factors such as host age, sex, breeding status, grazing habits, the level of education and economic capacity of the farmers, the standard of management and month and season of study can influence the prevalence of helminths (Stear *et al*., 2000; Magona and Musisi, 2002; Odoi *et al*., 2007). A low

prevalence of parasitic helminths during the dry season in small ruminants was also reported from other geographical areas of Ethiopia by several previous investigators in Ethiopia (Haileleul, 2002; Fikru *et al*., 2006) and from other parts of the world (Agyei, 2003; Kumba *et al*., 2003; Githigia *et al*., 2005; Waruru *et al*., 2005; Odoi *et al*., 2007). The results of the faecal examination in the sheep showed the presence of ova of strongyle type nematodes, *Moniezia* sp., *Skrjabinema ovis*, *Strongyloides* sp., *Trichuris* sp., larvae of *Dictyocaulus filaria* and *Fasciola* sp., in decreasing order. In the goats ova of the strongyle type nematodes, *Moniezia* sp., *Strongyloides* sp. and *Skrjabinema ovis* were detected in decreasing order.

The helminths recorded in the study area have also been reported previously in other areas of Ethiopia (Haileleul, 2002; Fikru *et al*., 2006; Bersissa and Ajebu, 2008; Kumsa *et al*., 2010; Kumsa and Abebe, 2009) and elsewhere in the world (Agyei, 2003; Kumba *et al*., 2003; Cernanska *et al*., 2005; Githigia *et al*., 2005; Opara *et al*., 2005; Waruru *et al*., 2005). The study showed that nematodes are the most common helminth parasites of both sheep and goats of the study area. The results also revealed that strongyle nematodes were identified as the most predominant helminths in both sheep and goat hosts in the area. This finding corroborates with the observations of Cernanska *et al*. (2005), Opara *et al*. (2005), Raza *et al*. (2007), Bersissa and Ajebu (2008) and Kumsa *et al*. (2010). The absence of ova of *Trichuris* and *Fasciola* sp. and larvae of *D. filaria* in the faeces of the goats may be attributed to the variation in the feeding behavior due to a higher proportion of time spent on grazing in sheep than in goats, enabling to the sheep to ingest the small number of infective larvae available during the dry season as has been reported by Raza *et al*. (2007). In the study polyparasitism, manifested as >1 type of genera of helminths in the faeces of both sheep and goat hosts of the study area was encountered as major findings. This finding agreed with reports of previous studies conducted in Ethiopia (Haileleul, 2002; Fikru *et al*., 2006; Bersissa and Ajebu, 2008; Kumsa *et al*., 2010) and elsewhere in the world (Sharkhuu, 2001; Agyei, 2003; Kumba *et al*., 2003; Nahed-Toral *et al*., 2003; Cernanska *et al*., 2005; Githigia *et al*., 2005; Opara *et al*., 2005; Waruru *et al*., 2005; Wang *et al*., 2006). This suggests that gastroenteritis caused by helminths is an important contributor of morbidity and loss of production in small ruminants in the study area.

The results of the coprocultures showed the predominance of *Trichostrongylus/Teladorsagia* sp., in both sheep and goats of the study area. This observation agrees with the previous reports of Maichomo *et al*. (2004), Ng'anga *et al*. (2004), Torina *et al*. (2004) and Cernanska *et al*. (2005). This finding contrasts with the reports of Agyei (2003), Githigia *et al*. (2005), Garcia *et al*. (2007), Raza *et al*. (2007), Bersissa and Ajebu (2008), Kumsa *et al*. (2010), Mbuh *et al*. (2008) and Tariq *et al*. (2008) all of which reported the predominance of *Haemonchus* sp. in small ruminants. This variation might be attributed to differences in the climate, agroecology, time of study and animal management.

In addition, it could be due to the fact that the free living stages of *Trichostrongylus/ Teladorsagia* sp., are more resistant to adverse environmental conditions such as high and low temperature and humidity than those of *Haemonchus* sp. as has been reported by Magona and Musisi (2002), Agyei (2003) and Ng'anga *et al*. (2004) who reported similar results during the dry season the year. In agreement with the previous report of Bersissa and Ajebu (2008) and Kumsa *et al*. (2010), the larvae of *Haemonchus* sp., *Oesophagostomum* sp., *Bunsotomum* sp. and *Strongyloides* sp., were also detected in decreasing order.

In the present study we found *Strongyloides* sp. and *Skrjabinema ovis* while only a few of the previous studies have reported about these genera. In the study, statistically significant variation was never observed in the prevalence of most helminths in sheep and goats of different age and sex and months of the study period which was most probably due to inadequate nutritional status during the dry season as stated by Tariq *et al*. (2008) and Kumsa *et al*. (2010).

CONCLUSION

In this study, owners of small ruminants in the study area are at a high risk of economic losses from decreased productivity of their animals as the majority of them harbored polyparasitism and because of the high pathogenecity of *Haemonchus* sp., especially in sheep and goats.

Thus, gastrointestinal should be considered among those diseases responsible for health and productivity problems in small ruminants. More detailed studies on helminths should be conducted to pinpoint appropriate times for strategic deworming. In addition, year round investigation is needed to know the species composition, survival strategy and ecology of the economically important parasitic nematodes of sheep and goats in the study area.

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