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Endoparasites of Donkeys in Sululta and Gefersa Districts of Central Oromia, Ethiopia

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Abstract: A cross sectional study was conducted to determine the species composition and prevalence of endoparasites of donkeys in Sululta and Gefersa districts of central Oromia from November 2008 to April 2009. For this purpose, a total of 417 faecal samples (209 from Sululta and 208 from Gefersa) were coprologically examined for nematode, cestode and trematode infections. In addition, 9 donkeys that died of various health problems or were euthanized for welfare reasons were necropsied and the parasites were recovered and identified. Coprological examinations showed prevalence of 99.5% strongyles, 53% *Parascaris equorum*, 9.8% Fasciola species, 5.7% *Gastrodiscus aegypticus* and 2.8% Anoplocephala species. Significantly ($p<0.05$) higher mean prevalence and overall epg count was observed for strongyles and *Parascaris equorum* in young donkeys than in both adults and old donkeys. Furthermore, ovaculture revealed 100% prevalence of strongyles, cyathostomins and *Trichostrongylus axei*, 73.8% *Strongylus vulgaris*, 42.8% *Strongyloides westeri* and 42.8% *Dictyocaulus arnfieldi*. Postmortem examination revealed the presence of ten different species of parasites. The overall worm counts ranged from 266-14112 with a mean of 1597 worms per donkey. All the postmortem examined donkeys were positive for one or more species of endoparasites. The results of the current study demonstrate that a wide range of parasites with high prevalence affect donkeys in Ethiopia.

Key words: Central Oromia, coproscopy, epg, Gefersa, endoparasite, postmortem, prevalence, Sululta

INTRODUCTION

Parasitic helminths are one of the most common factors that constrain the health and working performance of donkeys worldwide. Parasites cause various degrees of damage depending on the species and number present, nutritional and the immune status of equids. In donkeys, infection by endoparasites are responsible for problems including poor body condition, reduced power output, diarrhea, colic, emaciation, impaired growth, poor reproductive performance, short lifespan and predisposition to other infectious diseases (Fikru *et al*., 2005; Yoseph *et al*., 2005; Ayele *et al*., 2006; Getachew *et al*., 2009, 2010a, b).

Studies on endoparasites in working donkeys across several countries of the world have disclosed the involvement of several species (Sotiraki *et al*., 1997; Wells *et al*., 1998; Matthee *et al*., 2002; Mushi *et al*., 2003; Pereira and Vianna, 2006; Uslu and Guclu, 2007). These investigations have reveled that in developing countries where, nutrition and hygiene are generally poor helminths are highly prevalent and the major problems of donkeys. In Ethiopia where the health care is minimal especially for equines the prevalence, species composition and epidemiology of helminths affecting donkeys have not been investigated in detail (Getachew *et al*., 2009, 2010a).

However, the available information suggests that gastrointestinal helminths are the main reasons for early demises of donkeys in the country (Yoseph *et al*., 2001; Fikru *et al*., 2005; Ayele *et al*., 2006). Apart from few studies in other parts of Ethiopia, there is no previous information on helminths of donkeys in Sululta and Gefersa districts of central Oromia. The present study was therefore, designed to determine the prevalence and composition of helminths and to assess the associations between helminths burden and parameters like body condition score, age and sex of donkeys in Sululta and Gefersa districts of central Oromia regional state in Ethiopia.

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MATERIALS AND METHODS

Study area: The present study was conducted from November 2008 to April 2009 in Suluta and Gefersa districts both of which are located in central Oromia regional state.

Sululta district is located in North Showa zone of Oromia regional state 21 km to the Northwest of Addis Ababa. The district is geographically situated at 9°26′N and 38°39′E. The area has an altitude of 2450 m above sea level. It has a temperature that ranges from 15-18°C. The main rainy season is from June to August. The feed source for donkeys and other grazing animals in percentage is 63% grazing, 35% crop residues and the remaining 2% improved forage. Animal production system is mainly mixed crop-livestock type of farming system (CSA, 2004).

Gefersa district is located in West Showa zone of Oromia regional state. The area is geographically situated at 9°3′N and 38°30′E. It has an altitude of 2400 m above sea level. The area receives an annual rainfall of 1060 mm. The monthly mean minimum and maximum temperatures are 4 and 23.3°C, respectively. The monthly mean relative humidity and rainfall are 50.4% and 43.4 mm, respectively (CSA, 2004).

Study animals: The study animals were donkeys found in Sululta and Gefersa districts of central Oromia in Ethiopia. Donkeys in the study areas were randomly selected for sampling for helminths examinations irrespective of age, sex and body condition scores and color. Previous studies conducted in Ethiopia have reported that the prevalence of helminths infection in donkeys ranges from 70-100% (Ayele *et al*., 2006; Getachew *et al*., 2009). Sample size was calculated with expected prevalence of 70% and 95 confidence interval with the absolute precision of 5% as described in Thrusfield (1995). The age of each study donkey was determined by dentition.

The donkeys were grouped into three age categories as young when the age is <2 years, adult when the age is from 2-10 years and old when the age is beyond 10 years as described by Yoseph *et al.* (2001). Body Condition Score (BCS) for each donkey was subjectively estimated as per the methods of Svendsen (1997) and Pearson and Ouassat (2000). The age, sex and BCS of each donkey were recorded.

Faecal collection and examination: Faecal samples were taken directly from the rectum using rectal gloves. Each sample was labeled with animal identification, owner's name, date and place of collection with indelible pen. Then samples were subjected to gross faecal examination for presence of parasites like *Anoplocephala* sp., *Cyathostomum* sp. and *Oxyuris equi* then samples were kept in refrigerator at 4°C for later examinations within 48 h using qualitative and quantitative parasitological techniques and Mac Master egg counting methods according to the standard procedures given by Soulsby (1982) and MAAF (1979).

Ova culture and L_3 identification: Faecal culture was done for those samples with eggs per gram faeces of >300 epg. The L_3 were recovered using Baermann technique. Then L_3 were counted and identified based on the shape and gut cells, relative size of sheath tail and shape of tail of larvae (Soulsby, 1982; MAAF, 1979). Where possible 100 L_3 were identified per group if <100 L_3 were available then all were identified.

Postmortem examination: Postmortem examination of nine donkeys that died of various health problems or were euthanized for welfare reasons was conducted as per the standard procedures and techniques of Soulsby (1982). The contents of each part of the gut was separately opened into container and irrigated with water. Then parasitological techniques like collection, identification and counting of the recovered parasites were employed. In addition, the lungs and liver were incised with scissors to expose lungworms and liver flukes, respectively according to the classical parasitological technique described by Soulsby (1982).

Data analysis: All collected data were stored in Excel software and analyzed, using STATA 9.1 Version and summarized by descriptive statistics including mean and percentage values. In all cases, 95% confidence intervals and statistical significance was considered when $p<0.05$.

RESULTS AND DISCUSSION

Gross faecal examination: Gross examination of faeces from a total of 417 donkeys showed the presence of endoparasites with the prevalence of 27% *Gasterophilus intestinalis*, 27% *Gasterophilus nasalis*, 3% small strongyles and 5% *Parascaris equorum*.

Faecal worm egg count and ova culture: Coprological examination of 417 donkeys revealed the presence of five different helminths (Table 1). Strongyle type nematodes were detected in 415 (99.5%) examined donkeys followed by *P. equorum*. The prevalence of strongyles was significantly ($p<0.05$) higher than all the other detected helminths (Table 1). In addition, the study showed that the mean epg and overall prevalence of strongyle type

nematodes was significantly higher than the other encountered helminths in all age groups of donkeys (Table 2). The epg and prevalence of stongyles and *P. equorum* were higher in young and adult donkeys than the other age groups of donkeys.

The study showed that greater proportion of young donkeys were with severe (51.9%) and heavy (29.6%) degree of epg than both light and moderate degree of epg (Table 3). On the contrary greater proportions of both adult and old donkeys were with light and moderate degree of epg than severe and moderate epg levels (Table 3).

In the study, high epg was observed in donkeys with body condition score of 1 and 2, unlike in donkeys with BCS of 3-5 that had lower epg count.

Identification of L_3 of nematodes from coprocultured faeces of donkeys showed the predominance of cyathostomes, *S. vulgaris* and *T. axei* than the other nematodes (Table 4).

Postmortem examination: Postmortem examination of nine donkeys revealed a total of ten types of parasites. *S. vulgaris*, *S. edentatus* and cyathostomes were detected in all the examined donkeys with significantly higher prevalence than all the other parasites encountered (Table 5). The results of gross examination of faecal samples of donkeys agrees with the previous investigations of Fikru *et al.* (2005), Yoseph *et al.* (2005) and Ayele *et al.* (2006) who reported similar findings. Although, some of these researches indicated association of Gasterophilus larvae infestation with rectal prolepses in the current study this was not observed.

The study showed that strongyle type nematodes were significantly higher than all the other detected helminths. This findings is in agreement with previous studies made by Fikru *et al.* (2005), Yoseph *et al.* (2005), Ayele *et al.* (2006), Wubishet (2008) and Getachew *et al.* (2009) who reported a prevalence of 100% in donkeys in different parts of Ethiopia. This is most probably attributed to the lack of intervention with anthelmintics in both Sululta and Gefersa districts of central Oromia. This observation of high prevalence also agrees with several previous reports from different parts of the world (Eysker and Pandey, 1989; Lyons *et al.*, 2000; Matthee *et al.*, 2002; Meana *et al.*, 2005; Bu *et al.*, 2009). The finding of significantly higher prevalence and mean epg of strongyles in young donkeys may suggest the lack of immunity to these parasites as has been reported by Uslu and Guclu (2007).

The prevalence of 53% *Parascaris equorum* recorded in the current study is in agreement with previous reports of Ayele *et al.* (2006) and Zerihun (2008) who reported 43 and 42.8% in Dugda Bora district and highlands of Wollo provinces, respectively. However, the prevalence is higher than the previous report made by Fikru *et al.* (2005) (17.3%). The prevalence and mean epg of *Parascaris equorum* was significantly ($p<0.05$) higher in young donkeys than the other age groups. This is most probably

Table1: Overall prevalence of helminths in 417 donkeys in Sululta and Gefersa districts in central Oromia

Parasites	No. of positive	Prevalence (%)	SE	UCL	LCL
Strongyle	415	99.5	0.0033873	0.9885454	1.001862
P. equorum	222	53.2	0.0244631	0.4842874	0.580460
Fasciola sp.	41	9.8	0.0145983	0.0696257	0.127010
G. aegyptiacus	24	5.7	0.0114188	0.0351083	0.079990
Anoplocephala sp.	12	2.9	0.0081966	0.0126650	0.044880

UCL = Upper Confidence Limit; LCL = Lower Confidence Limit

Table 2: Overall mean EPG and prevalence of helminths in donkeys of different age groups in Sululta and Gefersa districts

	Mean EPG			Overall prevalence		
Parasites	Young	Adult	Old	Young	Adult	Old
Strongyle	1044.44	845.04	1000	100	99.4	24.675
P. equorum	448.15	184.67	10.39	100	60.75	6.5
G. aegyptiacus	14.815	14.38	18.19	3.7	5.7	6.5
Anoplocephala sp.	3.70	6.7	2.59	3.7	3.2	1.3
Fasciola sp.	7.41	25.56	24.67	3.7	10.86	7.8

Table 3: Level of infection of strongyles in different age groups of donkeys

	Degree of infection				
Age groups	Mild	Moderate	Heavy	Severe	Total
Young	11.1 (3)	7.4 (2)	29.6 (8)	51.9 (14)	100 (27)
Adult	40.9 (128)	14.05 (44)	24.9 (78)	20.12 (63)	100 (313)
Old	42.85 (33)	11.69 (9)	28.58 (22)	16.88 (13)	100 (77)

Table 4: Larvae of nematodes identified from coprocultured faeces of donkeys in Sululta and Gefersa districts

Larvae identified	No. of positive	Percentage	95% CI	Values
Cyathostomins	42	100.0	100	100
Strongylus vulgaris	42	100.0	100	100
Trichostrongylus axei	42	100.0	100	100
Strongylus edentatus	31	73.8	0.599	0.8767
Strongyloides westeri	18	42.8	0.2724	0.5846
Triodontophorus	22	52.8	0.3772	0.6959
Dictyocaulus arnfieldi	18	42.8	0.2724	0.5846

CI = Confidence Interval

Table 5: Prevalence, sites and adult parasite burden in postmortem examined 9 donkeys

Parasites	Predilection site	Range of parasites	Mean parasites	Positive donkeys
S. vulgaris	Cranial mesenteric artery	20-180	100	9 (100%)
S. edentatus	Colon, caceum	40-120	60	9 (100%)
Cyathostomes	Colon, caceum	30-2500	450	9 (100%)
D. arnefieldi	Lung	40-800	420	7 (77.7%)
F. hepatica	Liver	30-130	80	7 (77.7%)
G, intestainalis	Pyloric sphincter, rectum	50-200	125	5 (55.5%)
G. nasalis	Pyloric sphincter, rectum	30-150	90	3 (33.3%)
P. equroum	Duodenum	16-80	48	5 (55.5%)
G. agepticum	Duodenum	4-12	8	3 (33.3 %)
A. perfoliata	Ileocecal valve	6-10	8	2 (22%)
Overall	-	266-14112	1597	9 (100%)

due to the fact that young donkeys have less immunity against *Parascaris equorum* infection than both adult and old donkeys. This agrees with the earlier report by Zerihun (2008) in central Showa, Ethiopia. However, this finding contrast the research of Ayele *et al.* (2006) and Getachew *et al.* (2009) who reported absence of statistically significant differences in the prevalence of *Parascaris equorum* among donkeys of different age groups that may reflect differences in the study design and geographic locations.

The prevalence of 9.8% for *Fasciola* sp., recorded in the current study is higher than the previous report by Ayele *et al.* (2006) who reported 1.5% in Dugda Bora district. This higher prevalence suggests that *Fasciola* sp. is common in highlands where donkeys share the same grazing area with ruminants that are considered as primary hosts of liver fluke and favorable ecological conditions which allow multiplication and spread of intermediate snail host in both study districts as has been reported by Getachew *et al.* (2010a, b).

The prevalence of 5.7% for *Gastrodiscus aegypticus* recorded in the current study is in agreement with previous research done by Ayele *et al.* (2006) who reported 6% in Dugda Bora district. Lower prevalence of *Anoplocephala* sp., 2.7% recorded in this study as compared to reports by Yoseph *et al.* (2005), Fikru *et al.* (2005) and Getachew *et al.* (2010a) might reflect the seasonality of orbited mite intermediate hosts and differences in study period and locations. The low prevalence also could be due to the sporadic discharge of gravid segments in the faces and the difficulty of detecting eggs of cestodes by routine faecal examinations as a result use of sensitive methods like serology is needed.

There was a significant ($p = 0.003$) association between Body Condition Scores (BCS) of donkeys in the study areas and the level of strongyle type nematode infections. The study revealed negative association between body conation scores and level of GIT parasitic infections in donkey of the study area.

This suggests that body condition score was negatively associated with the level of GIT helminths and can be used as indicator of burden of parasites and helps owners and veterinary professionals to identify donkeys that requires treatment against helminhts. Similar observations were reported by previous investigators (Matthee *et al.*, 2002; Fikru *et al.*, 2005; Ayele *et al.* 2006; Getachew *et al.*, 2009; Brady and Nichols, 2009).

Analysis of the degree of infection by helminths as determined by epg of donkey showed that the greatest proportion of young donkeys were with severe degree (51.8%) followed by moderate degree (29.6%) whereas the majority of adult and old donkeys were with mild degree of infection 41 and 28.57%, respectively. This observation is in agreement with the previous research of Matthee *et al.* (2002) and Getachew *et al.* (2009).

This might suggest that young donkeys have less immunity against helminths than both adult and old donkeys. The highest mean strongyle egg count was observed in young age group. This finding is in agreement with previous studies by Fikru *et al.* (2005) and Ayele *et al.* (2006).

Identification of infective larvae of helminths showed that *Strongylus vulgaris*, cyathostomes, *Trichostrongylus axei* were the major larvae encountered with highest percentage of 100%. The prevalence of *Strongylus edentatus* and *Dictyocaulus arnfieldi* were 73.8 and 42.8%, respectively. This finding agrees with observations of Ayele *et al.* (2006) and Yoseph *et al.* (2001) who reported 100%. This supports the observations of high overall prevalence and high epg results recoded coprological examinations of the current study.

Postmortem examination of the nine donkeys uncovered the presence of ten different types of parasites. All the examined donkeys harbored one or more types of parasites. This observation again supports the high prevalence of helminths recorded in the coprological findings of this study. This observation corroborates the previous research of Yoseph *et al.* (2001, 2005) and Getachew *et al.* (2009, 2010a) who reported 100% prevalence of helminths after postmortem examination of donkeys in Wonchi and in East and West Showa, respectively.

CONCLUSION

The present study showed the presence of a wide range of species of helminhs that may play great role in confronting the health and welfare of donkeys in the study districts in central Oromia. The observation of polyparasitism with high prevalence and high overall epg and worm counts suggests the presence of favorable environmental conditions for survival, infection and perpetuation of helminths of donkeys in Ethiopia.

The lack of effective veterinary services and poor awareness of animal welfare has also exacerbates the situation. However, the information on the different aspects of donkey parasitology is still limited. Hence, a detailed study on the species composition, epidemiology, pathogenecity, treatment, control strategies and immune reaction to the most economically important species of helminths in donkeys is highly recommended.

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