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*Full Length Research Paper*

# Prevalence, intensity and major species of gastrointestinal parasites of donkeys in Adami Tulu Jido Kombolcha District, Central Ethiopia

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**A cross-sectional study was conducted to determine the prevalence, intensity and risk factors of major gastrointestinal parasites of donkeys in Adami Tulu Jido Kombolcha district, Central Ethiopia. A total of 525 faecal samples were co-prologically examined for gastrointestinal parasites infections. The overall prevalence of gastrointestinal tract (GIT) parasite infestation was high (98.67%), with females more infested than males and majority of the donkeys had massive infestation (49.59%), as compared to those with moderate (27.21%) or light infestation (23.20%). The respective helminth parasites prevalence observed was: Strongyles (98.7%), *Parascaris equorum* (28.8%), *Dictyocaulus arnfiedi* (14.3%), *Triodontophorus* (13.14%), *Cyathostomes* (9.7%), *Strongloides westeri* (6.3%), *Gastrodiscus aegypticus* (5.0%), *Anoplocephala* (4.6%), *Oxyurisequi* (3.8%), *Gastrophilus* species (2.85%) and *Fasciola* species (1.76%). Of the examined, 80% had mixed infection with two or more parasites. Upon further coproculture analysis, the predominant larvae of GIT parasites recovered were: *S. vulgaris*, *P. equorum, S. edentatus*, *T. axie*, *S. equinus* and *Dictyocaulus arnfieldi*. The prevalence of gastrointestinal parasites was higher in female donkeys than males with statistically significant differences ($p < 0.05$) between them. The results demonstrate that prevalence rate of gastrointestinal parasite infection was relatively higher in females, young and poor body conditioned donkeys than males, adult and good body condition scores. The results generated can inform the design of control strategies for helmenth infestation in donkeys. An immediate intervention seems an emphasis to awareness creation about the strategic deworming, animal welfare and management for control of helmenth infestation in donkeys.**

**Key words:** Ovo-culture, eggs per gram (EPG), faeces, intensity, gastrointestinal parasite, prevalence, Central Ethiopia.

## INTRODUCTION

Donkey (*Equus asinus*) is one of the most important drought animals. They have decisive role in the

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agricultural system of many developing countries. This is revealed by the widespread use of donkey in rural and urban areas in Africa (Pearson et al., 1999). Donkeys are used for packing, transportation, riding, carting, threshing, farm cultivation and milk and meat production for human consumption (Fielding and Pearson, 1987). They appear to be affective in assisting women both in domestic responsibilities and income generation activities (Marshal and Ali, 2004).

Donkeys are often described as hardy and resistant animals, but they do suffer a number of health problem. The most important one are parasitic disease, especially, gastrointestinal parasites, harness sore, sarcoids and infectious disease such as anthrax (Alemu et al., 2004).

Gastrointestinal parasites of donkeys are among the most common factors that hamper the health and working performance of donkeys in tropical and subtropical environment of the world. The parasites inflict diverse degree of injuries based on the species and quantity present, nutritional and immune status of eqiuds (Krecek et al., 1994). In donkeys, infection by internal parasites are accountable for constraints such as poor body condition, reduced power output, diarrhea, colic, emaciation, impaired growth, poor reproductive performance, short lifespan and vulnerability to other infectious diseases (Fikru et al., 2005; Yoseph et al., 2005; Ayele et al., 2006; Getachew et al., 2009). Helminthes parasite of eqiuds is among the most neglected areas of veterinary care in most part of the developing world (Getachew et al., 2009).

Investigations on endoparasites in working donkeys across several countries of the world have revealed the contribution of various species (Wells et al., 1998; Matthee et al., 2002; Pereira and Vianna, 2006). These observations have showed that in developing countries where, nutrition and hygiene are generally poor, helminths are mainly common and the major setbacks to donkey population. In Ethiopia, where the health care is minimal, particularly for equines, the prevalence, species composition and epidemiology of helminths affecting donkeys have not been explored in detail (Ayele et al., 2006).

Analysis of the existing literatures in Ethiopia strongly support that GIT parasites of donkey is nationwide distribution and is also considered as one of the major constraints to donkey productivity resulting in huge direct and indirect losses in the country (Getachew et al., 2009; Regassa and Yimer, 2013; Wako et al., 2016). Previous investigations undertaken in Ethiopia have reported that the prevalence of helminths infection in donkeys ranges from 70 to 100% (Ayele et al., 2006; Getachew et al., 2009).

Several studies conducted so far in various parts of Ethiopia revealed that gastrointestinal helminths are the main reasons for early death 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 paucity of information and no published data on gastrointestinal parasites of donkeys in Adami Tulu JidoKombolcha district of East Shoa, Oromia Regional State, Central Ethiopia. The present investigation was therefore, designed to establish the prevalence and major GIT parasites of donkeys and to assess potential risk factors in Adami Tulu JidoKombolcha districts of East Shoa, Oromia Regional State, Central Ethiopia.

## MATERIALS AND METHODS

### Description of the study area

The study was undertaken in Adami Tulu Jidokombalcha district which is part of the Rift valley that lies 130-180 km south of Addis Ababa at an altitude of 500-1800 m above sea level. The area has an annual rain fall ranging from 500 - 900 mm. The rain fall is bimodal with short rainy season from March to May and long rainy season from June to September, followed by the dry season from October to February. The area has an average maximum and minimum temperature of 27.2 and 12°C, respectively and relative humidity of 60%. Agricultural production system of the study districts is mixed farming with crop and livestock production system (CSA, 2012).

### Study animals

The study animals were donkeys found in Adami Tulu Jidokombalcha district of East Shoa, Oromia Regional State, Central Ethiopia. Donkeys in the study areas were randomly selected for sampling for gastrointestinal parasite examinations regardless of age, sex and body condition scores. All the donkeys are under extensive management systems and they are left on limited grazing land that expose them to high infestation of the parasites and most of the owners do not provide them additional feeding. Furthermore, all donkeys in the district are working for long period of time that may suppress their immunity and expose them to parasitic infestation.

### Study design

A cross-sectional study design was undertaken to establish the prevalence of major gastrointestinal parasites of donkeys and to assess putative risk factors associated with the infection.

### Sampling technique and sample size determination

Sampling was performed using simple random sampling method to select individual donkeys. The sample size required for the study was calculated according to the formula recommended by Thrusfield (2007) for simple random sampling.

$$n = \frac{(1.96)^2 P_{exp} (1 - P_{exp})}{d^2}$$

Where: n = required sample size, Pexp = expected prevalence and d = desired absolute precision. Since there is no reasonable research done in this area so far, the sample size is calculated using a method recommended by Thrusfield (2007), with 95% confidence interval, at 5% desired absolute precision and expected prevalence of 50%. Accordingly, the total numbers of sample

required for this study was 384 donkeys, but to increase precision of the study and representativeness of the sample, 525 donkeys were sampled. In Adami Tulu JidoKombolcha district, there are 43 peasant associations. Out of them, 28 were selected by considering them to be representative of the whole peasant associations. Then, the peasant associations were grouped into three depending on their vicinity to the three market places, that is, Bulbula, Adamitulu and Ziway market places. Then, the donkeys coming to market places on market days were randomly selected irrespective of their origin or peasant associations. Proportionality of incorporating donkeys in the sample was applied as per the population size of each peasant associations.

### Study methodology

#### *Faecal sample collection*

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. The faecal samples were immediately transported to Laboratory of Veterinary Parasitology of Adami Tulu Research Center and kept in refrigerator at 4°C for immediate processing and examination of the sample (within 24 h).

#### *Qualitative faecal examination*

The samples were subjected to gross faecal examination for presence of parasites (larvae recovery) such as *Anoplocephala* sp., *Cyathostomum* sp. and *Oxyuris equi*. The recovered larvae of *Gastrophilus* species was identified using stereomicroscope. Direct faecal smear, floatation and sedimentation techniques were used to identify eggs in faeces microscopically according to the standard procedures given by Soulsby (1982).

#### *Quantitative faecal examination*

A quantitative faecal examination was accomplished to identify level of infestation by using a modified McMaster egg counting technique to count parasite eggs selectively on those samples positive for nematode parasitic eggs upon qualitative procedure. The degree of infection in donkeys were determined by using the infection severity index recommended by Soulsby (1982) where an average total faecal nematode egg count of < 500 eggs per gram (EPG) was considered as light infection, 500-1000 as medium infection and > 1000 as massive infection.

### Faecal culture, recovery and identification of larvae

Faecal samples collected from the donkeys were cultured to recover GIT parasite larvae for species identification using Baermann technique. Larvae were differentiated based on the shape and number of gut cells, relative size and shape of larvae's tail according to the method described by Kaufmann (1996).

### Risk factors assessment

During sample collection, various putative risk factors such as origin, sex, estimated age and the animals' body condition scores were recorded. Variables such as age and body condition score were recorded simultaneously. The age of the donkeys was determined from birth records of owners' information and by dentition (Cran, 1997; Svendsen, 1997). Body condition score was subjectively estimated according to the standard given by NEWC (2005) and classified as poor, medium and good.

### Data storage and analysis

All data collected were entered into a Microsoft Excel spreadsheet and checked for accuracy. After validation, data were transferred to STATA version 11.0 for Windows (Stata Corp. College Station, TX, USA) for analysis. Categorical variables were summarized as frequency and percentages; continuous variables were summarized as mean ± standard deviation (SD). The dependent variable considered in the analysis of our data was parasite infection status and the explanatory variables considered were age, origin, sex and body condition score. Prevalence of parasite infection was calculated as number of positive donkeys on coprological examination divided by total number of donkeys investigated and multiplied by 100%. The association between the independent factors and the prevalence of gastrointestinal parasites was evaluated using the Chi-square ($\chi 2$) and Fisher's exact tests where ever appropriate. The 95% confidence interval and a p-value <0.05 was considered statistically significant.

## RESULTS

### Overall prevalence of gastrointestinal parasites

Out of the 525 donkeys investigated, 518 were found positive with one or more gastro intestinal parasites, giving an overall prevalence of 98.67%. The highest prevalence was recorded at Bulbula (210/211, 99.53%) followed by Ziway (218/222, 98.20%) and Adami Tulu (90/92, 97.83%), however, with no statistical significant difference ($p > 0.05$) in prevalence of gastrointestinal parasites between the study sites. The occurrence of gastrointestinal parasites was significantly higher in female donkey, 100% (246/246) as compared to male, 97.49% (272/279) ($P < .05$). Prevalence of gastrointestinal parasites was not significantly varied with the study site, age groups, body condition score ($P > 0.05$) (Table 1).

### Qualitative and quantitative examination

Examination of faecal samples collected from a total of 525 donkeys revealed that 518 of the donkeys were found positive for one or more helminth parasites. The helminth parasites, with their respective prevalence, observed in the study include: *Strongyles* (98.7%), *Parascaris equorum* (28.8%), *Dictyocaulus arnfiedi* (14.3%), *Triodontophorus* (13.1%), *Cyathostomes* (9.7%), *Strongloides westeri* (6.3%), *Gastrodiscus aegypticus* (5.0%), *Anoplocephala* (4.6%), *Oxyurisequi* (3.8%), *Gastrophilus* species (2.9%) and *Fasciola* species (1.8%) (Table 2).

The study further indicated that approximately 80% of donkeys examined for gastrointestinal parasites had mixed infection with two or more parasites. Infestation

**Table 1.** Prevalence of GIT parasites in relation to site, sex, age and body condition.

| Factors | No. examined | Prevalence (%) | χ2(Fisher's exact test) | *P* value |
|---|---|---|---|---|
| **Site** | | | | |
| Bulbula | 211 | 210 (99.53) | 2.049 | 0.359 |
| Zuway | 222 | 218 (98.20) | | |
| Adami Tulu | 92 | 90 (97.83) | | |
| **Sex** | | | | |
| Female | 246 | 246 (100.00) | 6.255 | 0.016 |
| Male | 279 | 272 (97.49) | | |
| **Age group** | | | | |
| Young | 94 | 93 (98.94) | 0.063 | 0.801 |
| Adult | 431 | 425 (98.60) | | |
| **Body condition** | | | | |
| Poor | 78 | 78 (100.00) | 1.245 | 0.537 |
| Medium | 198 | 195 (98.48) | | |
| Good | 249 | 245 (98.39) | | |
| Overall | 525 | 518 (98.67) | | |

**Table 2.** Overall prevalence of each GIT parasite of donkeys examined in the study area.

| Parasites | No. tested | No. positive | Prevalence (%) |
|---|---|---|---|
| Strongyles | 525 | 518 | 98.7 |
| *Parascaris equorum* | 525 | 151 | 28.8 |
| *Dictyocaulus arnfieldi* | 525 | 75 | 14.3 |
| Triodontophorus | 525 | 69 | 13.1 |
| Cyathostomes /Trichonema species | 525 | 51 | 9.7 |
| *Strongloides westeri* | 525 | 33 | 6.3 |
| *Gastrodiscus aegypticus* | 525 | 26 | 5.0 |
| Anoplocephala species | 525 | 24 | 4.6 |
| *Oxyuris equi* | 525 | 20 | 3.8 |
| Gastrophilus species | 525 | 15 | 2.9 |
| Fasciola species | 525 | 10 | 1.8 |

**Table 3.** Single and mixed infections of GIT parasites in the study area.

| Samples positive for | No. positive | Prevalence (%) |
|---|---|---|
| Only one type of parasite | 103 | 19.88 |
| Two types of parasites | 226 | 43.44 |
| Three types of parasites | 174 | 33.59 |
| Four types of parasites | 13 | 2.51 |
| Five types of parasites | 2 | 0.39 |

with one, two, three, four and five types of parasites were observed in 19.88, 43.44, 33.59, 2.51 and 0.38% of donkeys examined, respectively (Table 3). The mean EPG of the observed parasites revealed a maximum for large strongyles and minimum for *Oxyuris equi* as depicted in Table 4.

Faecal samples that were positive to *Strongyle* species by qualitative floatation technique were subjected to EPG count using McMaster egg counting technique (Table 5). Accordingly, 23.20, 27.21 and 49.59% of the donkeys were found to be lightly, moderately and massively infested, respectively. The study showed that greater

**Table 4.** Overall mean standard error and confidence interval of eggs per gram of faeces.

| Parasites | Eggs per gram of faeces (EPG) | |
|---|---|---|
| | No. of animal tested positive | Mean ± Standard error |
| Strongyles | 518 | 1048.855 ± 47.6 |
| Cyathostomes | 51 | 229.166 ± 33.5 |
| Triodontophorus | 69 | 315.94 ± 26.69 |
| *Strongloides westeri* | 33 | 307.57 ± 45.49 |
| *Oxyuris equi* | 20 | 165.78 ± 27.05 |
| *Parascaris equorum* | 151 | 474.03 ± 31.69 |
| Anoplocephala | 24 | 229.16 ±33.5 |
| *Gastrodiscus aegypticus* | 26 | 190 ± 40.62 |

**Table 5.** Degree of infection of strongyles with different putative risk factors in the study areas.

| Factors | Degree of infection | | | |
|---|---|---|---|---|
| | Light | Medium | Massive | Total |
| **Site** | | | | |
| Bulbula | 23 (10.95) | 62 (29.52) | 125 (59.52) | 210 (100) |
| Zuway | 34 (15.50) | 70 (33.33) | 114 (52.29) | 218 (100) |
| Adami Tulu | 20 (22.22) | 24 (26.67) | 46 (51.11) | 90 (100) |
| **Sex** | | | | |
| Female | 39 (15.85) | 56 (22.76) | 151 (61.38) | 246 (100) |
| Male | 71 (26.10) | 69 (25.37) | 132 (48.53) | 272 (100) |
| **Age group** | | | | |
| Young | 24 (25.81) | 27 (29.03) | 42 (45.16) | 93(100) |
| Adult | 130 (30.59) | 128 (30.12) | 167 (39.29) | 425(100) |
| **Body condition score** | | | | |
| Poor | 11 (14.10) | 18 (23.08) | 49 (62.82) | 78(100) |
| Medium | 59 (30.26) | 55 (28.21) | 81 (41.54) | 195(100) |
| Good | 102 (41.63) | 59 (24.08) | 84 (34.29) | 245(100) |
| **Overall** | **120 (23.20)** | **141 (27.21)** | **257 (49.59)** | **518 (100)** |

proportion of female donkeys were with massive infection (61.38%) than both light and moderate degree of EPG. Furthermore, greater infection rates were recorded in young donkeys than light and moderate degree of infection. In this study, higher degree of infection was observed in donkeys with poor body condition score, unlike in donkeys with medium and good body condition score that had relatively lower EPG count (Table 5).

### Fecal culture analysis

Fecal samples collected were further subjected to copro-culture for recovery and identification of larvae. Analysis of ovo-culture revealed predominance of *S. vulgaris*, *P. equorum, S. edentatus*, *T. axie S. equinus* and *Dictyocaulus arnfieldi* (Table 6).

## DISCUSSION

The faecal examination conducted for this study using different techniques disclosed an overall gastrointestinal parasites infection with prevalence of 98.67%. This finding was in close agreement with the work previously conducted in other area of Ethiopia by Asefa et al. (2011) from Sululta and Gefersa, central Ethiopia who reported prevalence of 100%. However, the current finding is higher than the report of Takele and Nibret (2013) from Bahir Dar, Northern Ethiopia and Seyoum et al. (2015) from Shashemene, Southern Ethiopia and Wako from Dodola, South Eastern Ethiopia who indicated prevalence rate of 88.21, 86.5 and 75%, respectively. The difference in prevalence reports of gastrointestinal parasites in the current finding and other reports might be due to differences in farm management practices, variation in

**Table 6.** Percentage of larvae recovered from ovo-culture in the study district.

| Species of parasite | No. of donkeys infected | Percent affected |
|---|---|---|
| *Strongylus vulgaris* | 315 | 60.0 |
| *Parascaris equorum* | 151 | 28.8 |
| *Strongylus edentatus* | 118 | 22.5 |
| *Tricostrongylus axie* | 97 | 18.5 |
| *Strongylus equinus* | 84 | 16.0 |
| *Dictyocaulus arnfieldi* | 75 | 14.3 |
| *Cyathostomum coronatum* | 51 | 9.7 |
| *Triodonthophorus serratus* | 41 | 7.8 |
| *Strongloides westeri* | 33 | 6.3 |
| *Triodonthophorus tencollis* | 27 | 5.1 |
| *Anoplocephala perfoliata* | 24 | 4.6 |
| *Oxyuris equi* | 20 | 3.8 |

environmental temperature and humidity since warm and moistures favor their development and variation in study methods and materials employed by the investigators. The overall figure indicates high prevalence of gastrointestinal helminths in donkeys in the study area and they were infected with many different species. It might be a result of continuous exposure of donkeys to the range conditions that facilitates infection.

No statistical significant difference ($p > 0.05$) in prevalence of gastrointestinal parasites was observed between the study sites. However, relatively higher prevalence rate was recorded at Bulbula district. The possible explanation for the slight differences in gastrointestinal parasites among the study districts might be associated with the variations in management practices, individual animal factors, deworming strategy and accessibility to veterinary services.

Prevalence of gastrointestinal parasites was higher in female donkeys (100%) (246/246) as compared to male (97.49%) (272/279) with statistical significant difference ($P < 0.05$) in prevalence of gastrointestinal parasites between the two sexes. It is suggested that sex is a determinant factor influencing occurrence of parasitism (Maqsood et al., 1996) and females are more vulnerable to parasitism during lactation, pregnancy and per-parturient period due to stress and decline in immune status (Urquhart et al., 2007).

All samples examined were found positive for strongyles eggs. Microscopic faecal examination revealed that the prevalence of strongyles was 98.7%, regardless of location, sex, body condition score and age of the donkeys examined. This finding is in agreement with the work of Yoseph et al. (2001), Mulate (2005), Fikru et al. (2005), Ayele et al. (2006) and Getachew et al. (2009) who recorded prevalence of 100, 100, 98.2, 100 and 99% in Wonchi, highlands of Wollo province, western highlands of Oromia, Dugda Bora district and Ada, Akaki, Boset and Boreh, respectively.

The current prevalence of *Parascaris equorum* (28.76%) in the current study area was lower than that of the works of Ayele et al. (2006) and Asefa et al. (2011) who recorded prevalence rate of 50% in Dugda bora district, 42.8% in highlands of Wollo province and 53.2% in Sululta and Gefersa, respectively. In contrast, the result obtained in this investigation was higher than the reports of Yosef et al. (2001) and Fikru et al. (2005), who reported 15.7 and 17.3% from Wonchi and western high lands of Oromia, respectively. The observed variation in different localities is attributed to the variability in the length of the study period, the season during the study period, the availability of veterinary service and the ecology of the study districts.

The prevalence of *Dictyocaulus arnfieldi* (14.3%) in the present investigation was lower as compared to the finding of Ayele et al. (2006) who disclosed prevalence rate of 32%. The difference observed between these studies can be partly explained by the season, the technique employed and the time lag between sample collection and laboratory diagnosis. In this regard, this study was done in dry season of the year that limits the dispersion of the larvae from faeces of infested donkey to the pasture or there is no sufficient herbage with which the donkeys ingest the larvae.

Triodontophorus was identified with prevalence rate of 13.14% in the district which was lower as compared to finding of Ayele et al. (2006) who reported a prevalence rate of 50% on faecal culture. This difference could be due to the poor specificity of direct fecal examination than faecal culture in differentiating those gastrointestinal parasites having similar egg morphology. The prevalence of Strongloides westeri observed in the current study (6.3%) was consistent with the finding of Getachew et al. (2009) who reported a prevalence of 11% in donkey of Ada, Akaki, Bore and Boseti. In contrast, Ayele et al. (2006) recorded a higher prevalence (33.3%) in donkeys of Dugda Bora district of Ethiopia.

The prevalence of 6.3% for *S. westeri* recorded in the current study is in agreement with previous research

done by Ayele et al. (2006) who reported 6% in Dugda Bora district. However, the present study was different from prevalence of 11% by Getachew et al. (2010), 9.4% by Wako et al. (2016) and 24.5% by Shrinkhande (2009) in the incidence of helminth parasite in donkeys in Nappur. This difference arise from variation in environmental temperature and humidity since warm and moistures favor their development.

The prevalence of *Gastrodiscus aegypticus* (4.95%) obtained in the present study was in harmony with the finding of Ayele et al. (2006) who reported a prevalence of 6% in donkeys of Dugda bora district. However, it was far below the 30% prevalence reported by Getachew et al. (2009) from 215 donkeys examined for the presence of flukes. This difference may be due higher temperature in current study area which is not favorable for survival of the parasite.

Lower prevalence of *Anoplocephala* species (4.6%) obtained in this study as compared to reports by Fikru et al. (2005) and Getachew et al. (2010a) might reflect the seasonality of orbited mite intermediate hosts and variability in study period and locations. The low prevalence could also 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.

The prevalence of *Oxyuris equi* (3.8%) was in close agreement with the report of Fikru et al. (2005), Ayele et al. (2006) and Wako et al. (2016) who revealed prevalence rate of 2.1, 3 and 5.2%, respectively. But it was lower when compared with the work of Yoseph et al. (2001) who reported 32.4% in Wonchi. This difference may be due to the temperature of the study area which desiccates the highly vulnerable Oxyuris egg.

The prevalence of *Gastrophilus* species in the current study (2.85%) was found lower than the previous report made by Ayele et al. (2006) who reported 20.9% prevalence from donkeys in Dugda bora district from 339 donkeys examined. The observed difference between these two studies may be explained by the seasonal distribution of the fly. Adult flies occur only during latter summer and live only few days before the commencement of the dry season. However, the present study was performed during the dry season of the year; thereby exposure of the donkeys to eggs of the flies is very less and hence less or no larvae in the donkeys.

The prevalence of 1.76% for *Fasciola* species, recorded in the present study is in agreement with the previous finding by Ayele et al. (2006) who reported 1.5% in Dugda Bora district. However, it is lower than the report of Asefa et al. (2011) who recorded prevalence of 9.8%. This difference may be due to the difference of ecological condition for development of intermediate snail. This also indicted that *Fasciola* species are common in the high land where donkeys share the same grazing area with ruminants and favorable environmental condition which allows the multiplication and the dissemination of intermediate snail in the study area (Smyth, 1994).

Analysis of the degree of infection by helminths as determined by EPG of faeces showed that the greater proportion of young donkeys were with massive infection (49.59%) followed by moderate (27.21%) and light (23.20%) infection. This observation is in agreement with the previous reports of Matthee et al. (2002), Getachew et al. (2009) and Asefa et al. (2011). Gastrointestinal helminths are the major setbacks to productivity of donkeys in the country (Yoseph et al., 2001; Fikru et al., 2005; Ayele et al., 2006). This might be attributed to poor veterinary services and medication to donkeys (lack of deworming) and poor awareness of animal welfare which exacerbates the situation.

Majority of the young donkeys were with massive degree of infection (45.16%). This observations concord with the previous research of Fikru et al. (2005) and Ayele et al. (2006). This might suggest that young donkeys have less immunity against helminths than aged donkeys. Adult animals may acquire immunity to the parasites through frequent challenge and expel the ingested parasite before they establish infection (Urquhart et al., 2007). However, the finding of current investigation is not in line with the reports from Gambia where adults and older animals bear high worm burden (Fritsche et al., 2000).

The highest mean strongyle egg count was observed in poor body condition donkeys (62.82%). This finding is in agreement with previous studies by Fikru et al. (2005) and Ayele et al. (2006).This poor body condition might be due to malnutrition, other concurrent disease or the current parasitic infection which lead to poor immunological response to infective stage of the parasites. Poor body condition 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).

Analysis of faecal culture for differentiation of larvae disclosed mainly *S. vulgaris*, *P. equorum, S. edentatus*, *T. axie S. equinus* and *Dictyocaulus arnfieldi.* The current finding is in line with the previous observations of Yoseph et al. (2001). The predominance of the above nematodes larvae in study districts might be attributed to the suitability of the environmental temperature and humidity that favor hypobiotic larval development.

## Conclusion

The high prevalence rate of gastrointestinal helminthosis documented in donkeys in the study district is found to be very important due to its considerable pathogenic significance as well as losses in donkey productivity, incurring huge direct and indirect losses in the country.

The observation of poly parasitism with high prevalence and high overall egg per gram of faeces suggests the presence of favorable environmental conditions for survival, infection and perpetuation of helminths of donkeys in Ethiopia. Lack of effective veterinary services and poor awareness of animal welfare has also exacerbates the situation. However, 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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## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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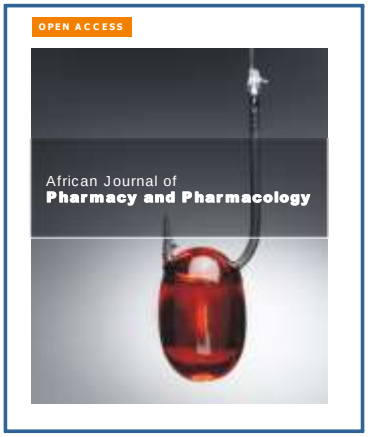








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