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The Status of Strongyle and Parascaris Population in Working Donkeys in Central Ethiopia

Zerihun Mesfin[1] Temesgen Bihonegn[2*]
1.Quarantine Import Export Inspection and Certification Directorate, Ministry of Agriculture, P.O. Box 62347, Addis Ababa, Ethiopia
2.Department of Animal Health, Kombolcha Agricultural College, P.O. Box 56, Kombolcha, Ethiopia

Abstract
A cross- sectional study was conducted in three selected districts of central Shoa, Ethiopia, from November 2007 to April 2008 to determine the prevalence and burden of strongyle and parascaris population in Adaa, Bereh and Boset districts. A total of 246 faecal samples were collected randomly from Bereh (n=56), Boset (n=85) and Ada (n=105) for qualitative and quantitative faecal analysis. The overall prevalence of Strongyles and *Parascaris equorum* was 92% and 32.50%, respectively. The prevalence of strongyle was 92.5% in Bereh, 87% in Boset and 95% in Adaa. The prevalence of *Parascaris equorum* was 43%, 26% and 32% in Bereh, Boset and Ada, respectively. Overall, 33% of the donkeys were positive for both strongyle and *Parascaris equorum*. There was no statistically significant difference (P>0.05) in prevalence rate of strongyle and parascaris across the study districts. The overall mean epg for strongyle and *Parascaris equorum* was 2893 and 120, respectively. Body condition score was not good indicator of level of parasitism in working donkeys. There was statistically significance difference (P<0.05) between age groups for the prevalence and mean epg of parascaris infection. As donkeys get access to deworing program increases, prevalence and parasitic burden decrease. Cultural identification of larvae revealed *S. vulgaris (67.5%),* S. *edentatus (46%), S. eqinus (8%), T. axei (58.5%), cyathostomes (35.8%), S. westeri (35.8%)* and *triodontophorus (15.8%) during this study.*
Keywords: Donkey, Parascaris equorum, Strongyles, Prevalence, Ethiopia

1. INTRODUCTION

Ethiopia, located in Eastern Africa, is predominantly an agricultural country. The country has diverse agro-ecological zones, which contributed to the evolution of different agricultural production systems. Animal production is practiced in all ecological zones of the country (Tegene and Crawford, 2000).

The domestic donkey (*Equus asinus*) belongs to the genus Equus and the family Equidae, which includes the wild asses of Africa and Asia as well as all the species of the horse and zebra. It is believed that all the domestic donkeys in the world are descended from Africa wild ass (Fielding and Krause, 1998T).There are about 115.2 million domestic equids (horses, donkeys and mules) in the world of which 44.3 million are donkeys and 57.6 million are horses. With 5.2 million donkeys Ethiopia has second largest donkey population in the world and nearly 40% of Africa donkey population (FAO, 2003).

Donkeys play an important role in socio-economic development by providing transportation in areas that are inaccessible by motorized vehicles or unaffordable modern form of transportation. In Ethiopia, the unsuitability of the area for motorized transportation, cost of road construction and high donkey population allow the use of these animals for capillary transportation (Abayneh *et al.,* 2002). Donkeys have also been used in land tillage in areas where the soil is loose and assist in threshing and trampling (Abayneh *et al*., 2002; Getachew *et al*., 1991).

Although donkeys are often described as hardy and resistant animals, they do suffer a number of health problems (Svendsen, 1997). Parasitic diseases have an economic impact on donkey as they cause loss through lowered fertility, reduced work capacity and increased treatment cost (Krecek and Mathee, 2002). These diseases are also serious to donkey welfare, causing pain in affected animals (Tabba *et al.,* 2002). Infections of working donkeys with gastro intestinal parasites are recorded from most countries of Africa and the central and mid Rift valley of Ethiopia. In Ethiopia, few studies done were in central and eastern parts of the country (Gebreab, 1998; Mohammed and Taketel, 1991).

The donkey health and welfare project has launched a deworming program since 1994 in selected districts of central Oromia. The project intended to know the current status of worm population in these intervention sites.

Therefore, the objective this study was to estimate the prevalence of worm burden of strongyle and parascaris population in working donkeys of the donkey health and welfare selected project sites.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted at three different agro-ecological zones, namely Adaa (mid land), Bereh (highland), and Boset (lowland) from November 2007 to April 2008.

Adaa: It is located at 8^0 7' N latitude and 39^0E (EMPDA, 1984), 45km South East of Addis Ababa. The

geography of the area is marked by a number of crater lakes. The altitude ranges from 1500-1800m asl and mean annual rainfall is 1115.6mm. The mean annual maximum and minimum temperatures are 30.5^0C and 8.5^0_C, respectively with a relative humidity of 61.3% (NMSA, 2004). The total land area of the district is 161,056 hectares. The donkey population is 46,222 (MOA, 2004).

Bereh: It is located 44-66 km North of Addis Ababa and at an altitude range of 2300-3000 asl. The mean annual rainfall is 3000mm. The average daily maximum and minimum temperature are 28^0C and 15^0C, respectively (NMSA, 2004). The total land coverage is 138,900 hectares. The donkey population is 24, 395 (MOA, 2004).

Boset: It is located in the East Africa Rift Valley, 100 km east of Addis Ababa with an altitude of 1500 m asl. Its total land coverage is 124,160 hectares. It has annual rain fall from 400mm to 800mm and temperature of 13.6^0 to 27.7^0c (NMSA, 2004). The donkey population is 37,181 (MOA, 2004).

2.2 Study Animals

The study animals were donkeys in three districts of Oromia Regional State, Central Shoa, maintained under traditional smallholder extensive management production system. The total number of donkeys in donkey health and welfare project sites is 107,798. All working donkeys in the donkey health and welfare project study areas was considered irrespective of age, sex, body condition score and color.

2.3. Determination of sample size

Studies made have indicated that the prevalence of strongyle infection in working donkeys of Ethiopia is in the range of 70-100 (Feseha *et al., 1991;* Yilma *et al.,* 1991).A sample size was calculated with expected 80% prevalence and 95% confidence interval with an absolute precision of 5% according to Thresfield (1995).

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

P exp = expected prevalence

d = desired absolute precision

1.96 = constant from normal distribution at a given confidence level

Consequently, a total of 246 working donkeys were sampled;56, 85 and 105 from Bereh, Boset and Ada, respectively.

2.4. Study design

2.4.1. Cross-sectional study

A purposive sampling was employed to select the three study districts (Adaa, Bereh and Boset) for logistic reasons. These districts consist of peasant associations (PAs). The study PAs were selected from each study district based on simple random sampling based on the sampling frame obtained from the districts' Agricultural Department. Systematic random sampling was employed to select donkeys for faecal sampling. The study protocol includes:

2.4.1.1. Collection and examination of faecal samples

Faecal samples were collected directly from the rectum by using rectal gloves. Each sample was labeled with animal identification, owner's name, date and place of collection with indelible pen. Samples were kept in refrigerator at 4^0C to be examined with in 48hrs for faecal egg counting and 7 days for larvae culture (MAFF, 1979).

2.4.1.1.1. Mac master method

This quantitative technique was used to count the number of eggs or larvae per gram of faeces. The method is outlined by MAFF (1979) and Urquhart *et al*.(1996).

2.4.1.1.2. Faecal culture

Those samples positive to Macmaster technique were subjected to faecal culture to see the strongyle larvae profile in study districts. The samples were cultured according to MAFF (1979).

2.4.1.1.3. Larvae recovery and identification

Approximately 20gm moist and crumbly faeces were broken up finely using spatula. Wide mounted plastic jars were filled with the faeces, closed with the lid and left at room temperature for 10-20days stirring the faeces each day to prevent the growth of fungi in the culture. L_3 larvae were recovered using Baerman technique (Annex 3). A drop of lugol's iodine was added to the sediment which stains the free living nematode yellow, while parasitic 3^{rd} stage larvae remain unstained. The larvae were then identified under low power microscopy (10x objective), based on the shape and number of gut cells, relative size of sheath tail and shape of larvae's tail (MAFF, 1979; Kaufmann, 1996).

2.5. Data analysis

The collected data were entered in to the computer using Excel software. The data were in a list format, i.e., a single row for each donkey, with columns for parasites recovered, EPG and animal identifications. Data were

cleared and STATA 9.2 for windows was used for analysis. In the analysis, confidence level was held at 95% and $p<0.05$ was set for significance.

3. RESULTS

3.1. Coproscopy

3.1.1. Quantitative faecal egg count

Prevalence of concurrent infection to both strongyle and parascaris was 33%.The over all prevalence and mean epg of strongyle and parascaris were 92% and 32.50%, respectively. There was no statistically significance difference ($P>0.05$) in the prevalence of strongyles and parascaris among districts. District level prevalence estimated for parascaris and srongyles are indicated in Table1.

Table 1: Prevalence and the over all mean (se) of fecal egg counts (epg) of strongyles and parascaris in donkeys in three districts of central Ethiopia.

Districts	No examined	Prevalence		Mean (se) epg		Ranges	
		Strongyles	Parascaris	Strongyles	Parascaris	Strongyles	parascaris
Bereh	56	52(92.86%)	24(42.86%)	2447.3 (303)	94.70(0.5)	100-9000	50-1150
Boset	85	74(87.06%)	22(25.88%)	2575.9(266.2)	93.15(0.03)	100-10000	50-3300
Ada	105	100(95.24%)	34(32.38%)	3656.2(315.9)	87.50(0.04)	100-11850	50-3300
Total	246	226(92%)	80(32.5%)	3007.7(180.1)	121.5(22.9)	-	-

There was no statistically significance difference between age groups for the prevalence and mean epg of strongyles infection (Table 2). There was statistically significance difference ($P<0.001$) between age groups for the prevalence and mean epg of parascaris infection (Table 2). Body condition score is poorly associated with the mean epg of both strongyle($r=0.005$) and parascaris($r=-0.07$) infection (Figure 1).

Figure 1. Strongyle and parascaris equorum prevalence and mean epg for different body condition scores

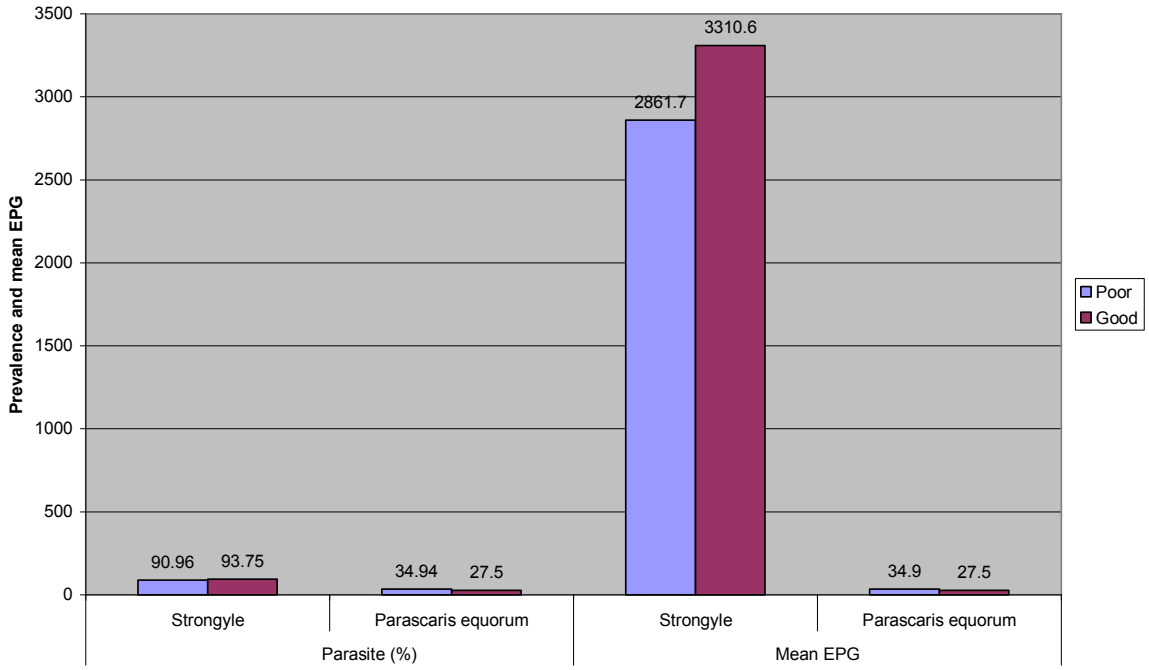

Table 2: Age specific eggs count of strongyles and parascaris.

Age (years)	No examined	Prevalence (%)		Mean (se) epg	
		Strongyles	parascaris	Strongyles	parascaris
<2.5yrs	19	97.74	42.86	94.7(0.5)	447.37(231.71)
2.5-4.5yrs	73	93.15	63.01	93.15(0.03)	206.85(32.63)
4.5-8yrs	64	87.50	18.75	87.5(0.04)	40.63(12.93)
>8yrs	90	93.33	10.00	93.33(0.03)	41.11(20.94)

Deworming frequency had statistically significant association with prevalence of strongyle (p=0.001) and *parascaris equorum* (p=0.016). The prevalence decreased as the frequency of deworming increases (strongyle: OR=0.33; *parascaris equorum:* OR= 0.53) (Table 3).

Table3. Proportion of strongyles and parascaris recovered against rate of deworming.

No examined	Frequency of deworming	Strongyles (%)		Parascaris (%)	
		Negative	Positive	Negative	Positive
78	Once	0	100	55.13	44.87
119	Two times	8.4	91.6	70.59	29.41
28	Three times	17.86	82.14	85.71	14.29
21	Four times	23.81	76.19	71.43	28.57

3.2. Differential larvae counts

Larvae were recognized and identified by their specific morphology traits according to MAFF (1979) (Annex 2). Seven types of helminth parasitic larvae were identified (Table 3) namely *S.vulgaris, S. edentatus, S. equinus, T. axei, Cyathostomes, S. westeri,* Triodontophoros spp (Table 4). There was statistically significant difference (P<0.05) in the recovery rate between districts (Table 4). *Strongylus vulgaris*, which is known for its high pathogenic effect, was 58.9%, 56.5% and 81.0% prevalence in Bereh, Boset and Ada respectively.

Table 4. Relative percentage of larvae of different parasites recovered from coproculture.

Districts	No examined	Prevalence (%)						
		S.vulgaris	S.edentatus	S.equinus	T.axei	Cyathomes	S.westeri	Triodontophoros
Bereh	56	33(58.9)	18(32.1)	0(0)	38(67.86)	29(51.86)	10(17.86)	8(14.3)
Boset	85	48(56.5)	28(32.9)	10(11.7)	24(28.2)	26(30.6)	41(48.2)	12(14.1)
Ada	105	85(81)	67(63.8)	10(9.5)	82(78.1)	73(69.5)	37(35.2)	19(18.1)
Total	246	106(67.5)	113(45.9	20(8.1)	144(58.5)	128(35.77)	88(35.77)	39(15.85)
P-value		P<0.001	P<0.001	P=0.035	P<0.001	P<0.001	P=0.001	P<0.001

4. DISCUSSION

The prevalence of strongyle was 92.86% in Bereh, 87.06% in Boset and 95.24% in Adaa. This study was comparable with estimates of Yoseph *et al* (2001), Mulate (2005), Ayele *et al* (2005) and Fikeru *et al* (2006) who reported 100%, 100%, 100% and 98.2% in donkeys of Wonchi, highland of Wollo province, Dugda Bora and western high land of Oromia, respectively. Age group had no statistically significant association with the prevalence and mean epg of strongyles. A similar finding was reported by Ayele *et al* (2005). This might be attributed to increase of land cultivation which restricts donkeys on small communal grazing land allowing the animals for continuous larvae exposure to infected pasture.

Parascaris equorum was detected in 42.86%, 25.88% and 32.38% of the donkeys incomparable Bereh, Boset and Ada, respectively. This prevalence estimate is similar to the findings of Feseha *et al* (1989), Mulate (2005) and Ayele *et al* (2006) who reported 39.7%, 43.8% and 50% in donkeys of Debre Zeit, South and North Wollo provinces and Dugda Bora.

The prevalence and mean epg of parascaris were higher in the young age group. This is in harmony with the report of Vercruyees *et al*. (1986) in Burkina Faso. Getachew *etal*(2008) Ayele etal(2006) have reported that there was no statistically significant difference in the prevalence of *P. equorum* between age groups. These different findings might be associated with difference in the sample size between these studies.

Cultural identification of larvae indicated 58.9%, 56.5% and 81.0% recovery rate of *strongyle vulgaris* in Bereh, Boset and Ada, respectively. There was significance difference (P<0.05) among the three districts. Donkeys in Ada have the highest prevalence than the other two districts. Recovery rate of S. *vulgaris* in the present study was lower than results reported by Yoseph *et al* (2001) and Ayele *et al* (2006). This might be due to the seasonal variation between these studies where the current study included only the dry season of the year.

S.vulgaris is the most pathogenic parasite in equine, causing unthriftness, weakness, and increased susceptibility to other infections and even death and fatal colic could also have arisen from strongylid overload (Khauayoune, 1991).

The prevalence of *S. edentatus* is higher in Ada (63.8%) than Bereh (32.1%) and Boset (32.9%).This result was in agreement with the work of Yoseph (1996) but not with Desalegne (2005) who reported 41.7% and 88.9%, respectively. The prevalence of Cyathostomes was lower than the report of Ayele *et al. (2006)* and Yoseph (1996) who reported 100%, 100% and 100% in donkeys of Dugda Bora, Central Oromia and Dire Dawa and east Oromia. This lower recovery rate in the current study could be due to the intervention of DHWP through regular deworming programme.

The prevalence of *T. axei*, as determined from different ova culture was 67.86%, 28.2% and 78.1% in Bereh, Boset and Ada, respectively and this was statistically different($P<0.05$). The larvae recovery rate of *T. axei* in Bereh and Ada are in agreement with Pandey *et al.* (1980) in Morocco but higher than Yoseph *et al.* (2000) and Desalegne (2003). The prevalence of *T.axei* in Boset (28.2%) was in agreement with the study of Yoseph *et al*. (2000) and Desalegne (2005). Increased frequency of deworming was protective for both Stronglosis and Parascariasis.This may be due to decreased pasture contamination by deworming hosts.

CONCLUSION AND RECOMMENDATIONS

The prevalence of the parasites identified in the present study is similar to that of the findings of earlier workers with high prevalence and mean epg in spite of the deworming programme launched in the study areas. This indicates that the parasite controls strategies need reconsideration. There is “no cut point” for the degree of parasitic infestation for donkeys and create great difficulty to classify the infestation to different levels. The cut point and possible indicators of degree of parasitism should be developed.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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