

Investigation of Gastrointestinal Helminths in Slaughtered Donkeys at Huacheng International Abattoir, Dodoma, Tanzania

M.R. Galibona¹, J. S. Nzalawahe² and H.E. Nonga¹ *

¹Department of Veterinary Medicine and Public Health, College of Veterinary Medicine and Biomedical Sciences, Sokoine University of Agriculture, P.O. Box 3021, Chuo Kikuu, Morogoro, Tanzania.

²Department of Veterinary Microbiology, Parasitology and Biotechnology, College of Veterinary Medicine and Biomedical Sciences, Sokoine University of Agriculture, P.O. Box 3019, Morogoro, Tanzania.

*Corresponding Author: hezron@sua.ac.tz

SUMMARY

In developing countries including Tanzania, the use of draught animal power like donkeys is constrained by inadequate and limited knowledge about their health problems and welfare. A cross-sectional study was conducted from June 2016 to August 2017 on 400 slaughtered donkeys to establish prevalence of gastrointestinal helminth at Huacheng international abattoir, Dodoma. A total of 1200 gastrointestinal content samples were collected from rectum, caecum and small intestine and examined by using floatation, sedimentation, MacMaster counting techniques for helminths eggs recovery and adult helminths. Data were summarized using descriptive statistics and analyzed by Epi-Info version 7.2.6.0. The prevalence of helminth infection was 88.4% and all infected donkeys had nematodes, 55% had trematodes and 0.5% were infected with cestodes. The common types of helminths infections were *Strongyle* (100%, n=400), *Paramphistomum* (55%, n=220), *Nematodirus* (51%, n=204) and *Parascaris* (45.8%, n=183). *Moniezia* (0.5%, n=2) were the least detected. Up to 60.3% (n=241) of the donkeys were infected with both nematodes and trematodes. Most donkeys (57.8; n=231) had severe levels of *Strongyle* infection with mean faecal egg count of 1885 ± 1228 per gram. Different parts of GIT influenced helminth colonization and the difference in infection rates was statistically significant ($\chi^2 = 282.53$; $p=0.000$) with rectum (88.4%) having highest helminths burden compared to small intestine (43.3%) and caecum (42.9%). Donkeys' husbandry practices need improvement along with routine veterinary services including routine deworming.

Keywords: Gastrointestinal helminths, draught animal, Government, donkeys, abattoir

INTRODUCTION

Donkeys are among the early-domesticated equines that have been a beast of burden for thousands of years. Despite the increase in mechanization throughout the world, donkeys still have a prominent position in the agricultural systems of many developing countries since are used as draught animal. Donkeys as draught animals are effective entry point for assisting

women not only in domestic responsibilities but also enabling them in income-generating activities which otherwise they may not have had access to (Marshall and Ali, 2004). In addition, donkeys are important in smallholder farming system especially in rural communities since are used for conveying people, goods, and farm inputs and outputs to and from farms (Swai and Bwanga, 2008). In developing countries including

Article History

Submitted: 17 Nov 2025

Revised: 25 Nov 2025

Accepted: 15 Nov 2025

Published: 10 Jan 2026

Tanzania Veterinary Journal Vol. 40(2) 2025

<https://dx.doi.org/10.4314/tvj.v40i2.1>

ISSN: 0856 - 1451 (Print)

ISSN: 2714-206X (Online)

<https://tvj.sua.ac.tz>

License terms

This article is available under the terms of the [Creative Commons attribution](https://creativecommons.org/licenses/by/4.0/) License (CC BY). You are free to use, reproduce, redistribute in any medium or format provided the original publication in this journal is cited.

Tanzania, the use of draught animal power like donkeys is constrained by inadequate knowledge and skills of farmers on their use, inadequate animal husbandry practices, and insufficient supply and high cost of appropriate farm implements (Tanzania National Livestock Policy, 2006). Nevertheless, animal diseases also constraint the performance of donkey industry as they succumb to wide range of infectious and non-infectious diseases (Svendsen, 1997). Donkeys suffer from inbreeding, poor nutrition, inadequate health and veterinary support services, trauma, colics and a wide range of infectious diseases (Segwagwe *et al.*, 1999; Swai and Bwanga, 2008; Getachew *et al.*, 2016).

Gastrointestinal (GIT) parasitic infestations constrain the health and working performance of donkeys worldwide. They cause various degrees of damage depending on the species and magnitude of infection, nutritional and the immune status of donkey (Asefa *et al.*, 2011). Most of the GIT parasites are active bloodsuckers with a potential of causing anaemia, weakness,

emaciation, colic and diarrhea (Burden *et al.*, 2010). GIT parasites also deprive donkeys from adequate absorption of digestive nutrients, which in the long run led to retarded growth and impaired productivity, reduced work output, discomfort, pains and sometimes death (Mezgebu *et al.*, 2013).

Regardless of the importance of donkeys in Tanzania, they are not given health care attention by the society and the government at large. They are perceived as disease resistant and stronger species by the general communities and even animal health policy makers (Marshall and Ali, 2004; Swai and Bwanga, 2008). Despite the importance of donkeys to the economy and livelihood of rural poor, knowledge about the health problems affecting donkeys in Tanzania are limited. Therefore, the purpose of this study was to identify and establish the magnitude of gastrointestinal helminth infestation in donkeys at Huacheng international abattoir, Dodoma, Tanzania.

MATERIALS AND METHODS

Description of the study area

Huacheng international abattoir is situated at Kizota Western industrial area in Dodoma City, Tanzania. All the slaughtered donkeys were purchased from Nala livestock market located in Dodoma city. Dodoma region is located at 6°10'23"S; 35°44'31"E, in the eastern-central part of Tanzania (Figure 1). The region, which is primarily semi-arid environments and moderate rainfall around the year, covers an area of 41,311

square kilometres. Huacheng international abattoir which slaughtered 40 donkeys per day was selected for study. The slaughtered donkeys originated from different areas of Tanzania such as Singida, Dodoma, Manyara, Tabora, and Arusha regions. The donkey population in Tanzania is estimated at 657,389 which are raised under extensive grazing system with minimal care (MLF, 2021).

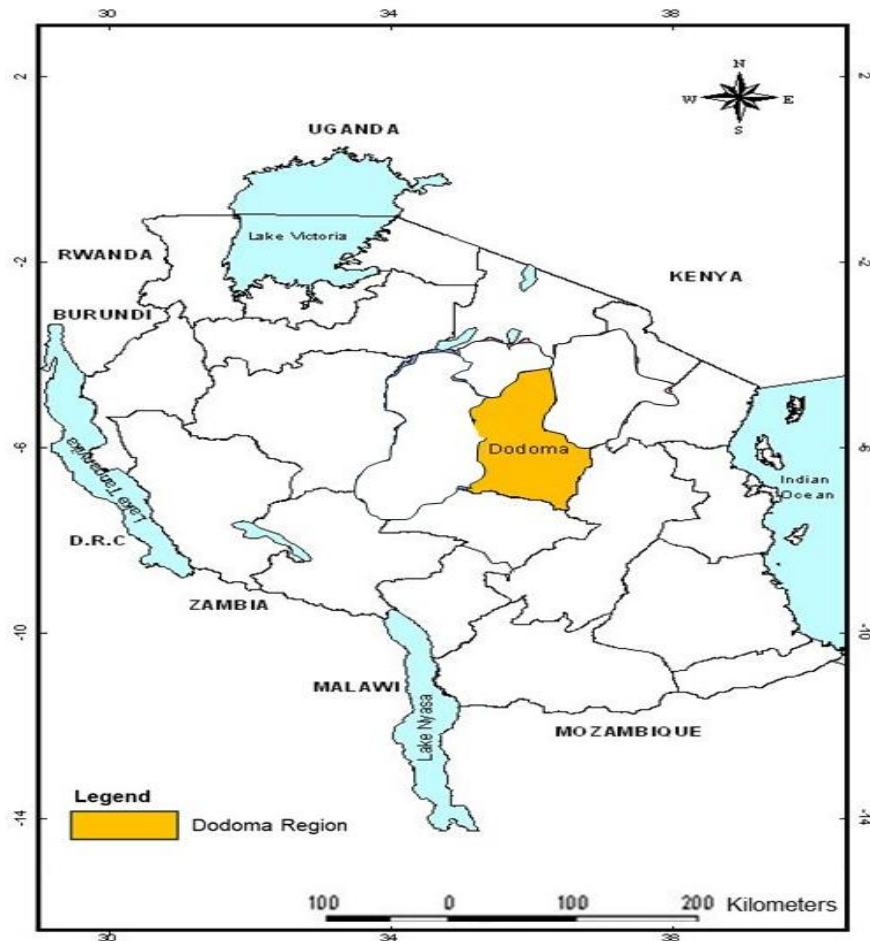


Figure 1: A map of Tanzania that show the relative location of Dodoma Region where Nala livestock market is located. **Source:** Tanzania administrative boundary 2012, Ministry of Land

Study design and sample Size

A cross-sectional study was conducted from June 2016 to August 2017 to assess the gastrointestinal parasites in donkeys. All slaughtered donkeys at abattoir were subjected to qualitative and quantitative coproscopic examination to identify the GIT helminth involved and estimate their prevalence in donkeys. The simple size of 400 donkeys was calculated by using a formula $n = Z^2P(1-P) / d^2$ as described by Daniel (1999). From the formula, n is the initial sample size, Z is the standard normal deviate at the desired confidence level (1.96 for 95% confidence), P is the prevalence, which was assumed at 50%, and d is the desired margin of error set at 5%. Substituting the values gives: $n = (1.96)^2 \times 0.5(1-0.5) / (0.05)^2 = 384$. To account for a potential of 5% non-compliance and increase precision rate, the sample size was increased by multiplying by 1.05,

yielding a final sample size of approximately 400 donkeys.

Sample collection and handling

During the visit at the abattoir, simple random selection of donkeys for slaughter was done from the lairage and every donkey in the slaughter line had an equal chance of being sampled. Information about age, sex and general body condition regarding as poor and good were collected through observation. The sources of the donkeys were obtained from the Nala livestock market where all slaughter donkeys landed and registered.

A total of 400 adult donkeys (244 males and 156 females) were sampled for quantitative and qualitative coprological examinations to identify the major GIT helminth involved. After opening the carcass, the GIT was carefully undermined and

pulled out, straightened and placed on the floor to clearly display the small intestine, caecum and large intestine. Each intestinal part was transversely cut to separate, longitudinally sliced and about 200 gm of contents from each GIT part was put into sample plastic bag for laboratory analysis. Since all the GIT parts were opened, the contents and the mucosae were examined for presence of adult helminths, collected and stored in 70% alcohol for laboratory identification.

For the larvae and adult helminths recovery the entire GIT was examined through taking contents from small intestine, caecum and rectum then sieved to obtain the helminth. The collected samples were stored under cold condition in the cool box with icepacks then transported to Visele Livecrop Skills Training Centre (VLSTC) and LITA Mpwapwa for preliminary analysis and sample storage. Subsequently, all the samples were transported to helminthology laboratory in College of Veterinary Medicine and Biomedical Sciences (CVMB) at Sokoine University of Agriculture (SUA) for further processing and identification. In the laboratory, faecal samples were stored under refrigeration at 4°C until analysis.

Qualitative and Quantitative analysis of gastrointestinal helminths

Qualitative analysis of nematode eggs was done as described by Hansen and Perry (1990). Three grams of intestinal contents (small intestine, caecum and rectum) were mixed differently with 50 mls of supersaturated salt floatation fluid into metal dishes by stirring and then filtered through a tea strainer into plastic glasses. The filtered solution was filled into the test tube to the top and covered with glass cover slip and left to stand for 20-25 minutes. Thereafter the cover slip was carefully lifted off from the test tube and placed on the microscope slide. Presence of nematode eggs was examined using a 4×10 magnification on a light microscope and identification was done by using standard keys based on their morphological features as described by Soulsby (1982).

Qualitative analysis of trematode eggs was done as described by Hansen and Perry (1990). Three grams of intestinal content from rectum was mixed with 50 mls of tap water into metal dishes by stirring and then filtered through a tea strainer into

plastic glasses. The filtered solution was allowed to sediment for 5 minutes. Then carefully discarding the supernatant and adding 5 mls of tap water and allow to sediment for extra 5 minute and repeated once. Sediment was stained with methylene blue /malachite green for 3-5 minutes before transferred to the microscope slide and covered with cover slip and examined under microscope at 4×10 magnification for the presence of trematode eggs.

Quantitative analysis of helminth eggs was done as described by Hansen and Perry (1990). Quantification of helminths eggs in rectum was done by use of McMaster counting technique. Three grams of rectal sample was placed into metal dishes mixed with 50 ml of supersaturated floatation table salt solution followed by stirring to have homogenous mixture then filtered through a tea strainer into a plastic glass. The filte was pipetted and filled into a McMaster counting chamber and left to stand for five minutes before was examined under a microscope at 10×10 magnification. Helminth eggs were separately counted in the graded area of both chambers. The egg per gram (EPG) of intestinal content was calculated by adding the counts of both chambers and multiplied by 50. Interpretations faecal egg counts in donkey was done as described by Soulsby (1982). Severity of infection was determined as follows: less than or equal to 500 EPG of faeces regarded as mild infection; 800-1000 EPG of faeces as moderate infection; and 1500-2000 EPG of faeces as severe infection (Soulsby, 1982).

Recovery of larvae and adult helminths

After separation of the GIT parts (rectum, caecum and small intestine) following their ligating off, their contents were mixed with water and passed through a series of graded screens/ sieves to remove solid debris and helminths (worms) were picked out of the clarified fluid remaining and preserved in 70% alcohol. Other larvae and adult helminths (*Gastrophilus* and *Parascaris*) were recovered direct from the large intestine (rectum) during the sample collection and stored in 70% alcohol. Helminths were identified by their morphological features as described by Soulsby (1982) macroscopically and microscopically at $4 \times$

10 magnification following mounting them on microscopic slide with lactophenol.

Data management and analysis

The data collected from the study area were entered into a Microsoft[®] Excel version 2007 spread sheet and descriptive statistics including percentages, frequencies, medians and means were used to describe and summarize data. Data

analysis was done using Epi-Info version 7.2.6.0 software (Centre for Disease Control, Atlanta, USA). Chi-square tests at a critical probability of $P < 0.05$ were applied to test the statistical association among the risk factor such as part of GIT, sex and body condition scoring with the presence of the infection.

RESULTS

Number of donkeys received at Nala Livestock Market and slaughtered at Huacheng abattoir between June 2016 and August 2017

The period from June 2016 to August 2017, a total of 19,497 donkeys were received at Nala

Livestock Market in Dodoma, and 17,739 (88.4%) donkeys were slaughtered at Huacheng abattoir. This study used 400 randomly selected donkeys that were slaughtered at the abattoir from June to August 2017 (Table 1).

Table 1: Number of donkeys received at Nala livestock market and slaughtered at Huacheng abattoir between June 2016 and August 2017.

Year	Month	Number of donkeys received	Number (%) of donkeys slaughtered	Average slaughter per day
2016	June	786	766 (97.4)	26
	July	1466	1042 (71.1)	34
	August	1071	1061 (99.1)	34
	September	2202	2095 (95.1)	70
	October	962	907 (94.3)	29
	November	1476	1028 (69.7)	34
	December	1710	1611 (94.2)	52
2017	January	2035	935 (46.0)	30
	February	1488	1058 (71.1)	34
	March	1312	840 (64.02)	27
	April	1085	1080 (99.5)	36
	May	1150	760 (66.1)	25
	June	889	695 (78.1)	23
	July	1216	1105 (90.9)	36
	August	1503	1402 (93.3)	45
	Total	19,497	17,239 (88.4)	38

Prevalence of helminths in slaughter donkeys

A total of 1200 intestinal content samples were collected from 400 slaughtered donkeys at Huacheng international abattoir. The details of donkeys' sex, age, body condition score and status of helminths species infection are detailed in Table 2 and 3. Generally, all slaughtered donkeys were infected with gastrointestinal helminths in the group of nematodes, 55% (n=220) in the group of

trematodes and 0.5% (n=2) in the group of cestodes. The common types of helminths infections were Strongyle (100%, n=400), *Paramphistome* (55%, n=220), *Nematodirus* (51%, n=204) and *Parascaris* (45.8%, n=183). *Moniezia* (0.5%, n=2) were the least detected. A total of 241 (60.3%) of the donkeys were infected with both nematodes and trematodes. Macroprology reveals that large number of worms were found in large intestine.

Burden of gastrointestinal helminths infection

The infection rates according to the age, sex and body condition scores were almost similar across and were not statistically significant. Table 2 and 3 presents the distribution of the single and multifunctions of gastrointestinal helminths in donkeys. Occurrence of Strongyles was associated with one or two combinations of other helminths. The common combinations were that of Strongyle

and *Nematodirus*, *Strongyle* and *Nematodirus* and *Paramphistome*, *Strongyle* and *Parascaris*, and *Strongyle* and *Nematodirus* and *Paramphistome* (Table 3). Occurrence of Strongyle eggs was significantly higher compared with the other helminth species encountered in three different parts of gastrointestinal tract namely, rectum (100%), caecum (70-73.9%), and small intestine (57.7-78.9%).

Table 2: Burden of single helminth species infection according to age, sex and body condition scores (n=400)

Risk factor (n)	<i>Strongyle</i>	<i>Nematodirus</i>	<i>Ascaris</i>	<i>Moniezia</i>	<i>Parascaris</i>	<i>Paramphistome</i>
Age						
Adult (400)	400 (100.0)	204 (51.0)	42 (10.5)	02 (0.5)	183 (45.8)	220 (55.0)
Sex						
Male (244)	244 (100.0)	117 (48.0)	20 (8.2)	06 (2.5)	112 (45.9)	131 (53.7)
Female (156)	156 (100.0)	96 (55.1)	24 (15.4)	02 (1.3)	70 (44.9)	87 (55.8)
Body condition Score						
BCS 3(310)	310 (100.0)	156 (50.3)	29 (9.4)	02 (0.7)	138 (44.5)	176 (56.8)
BCS 2(90)	90 (100.0)	47 (52.2)	13 (14.4)	0 (0.0)	45 (50.0)	45 (50.0)

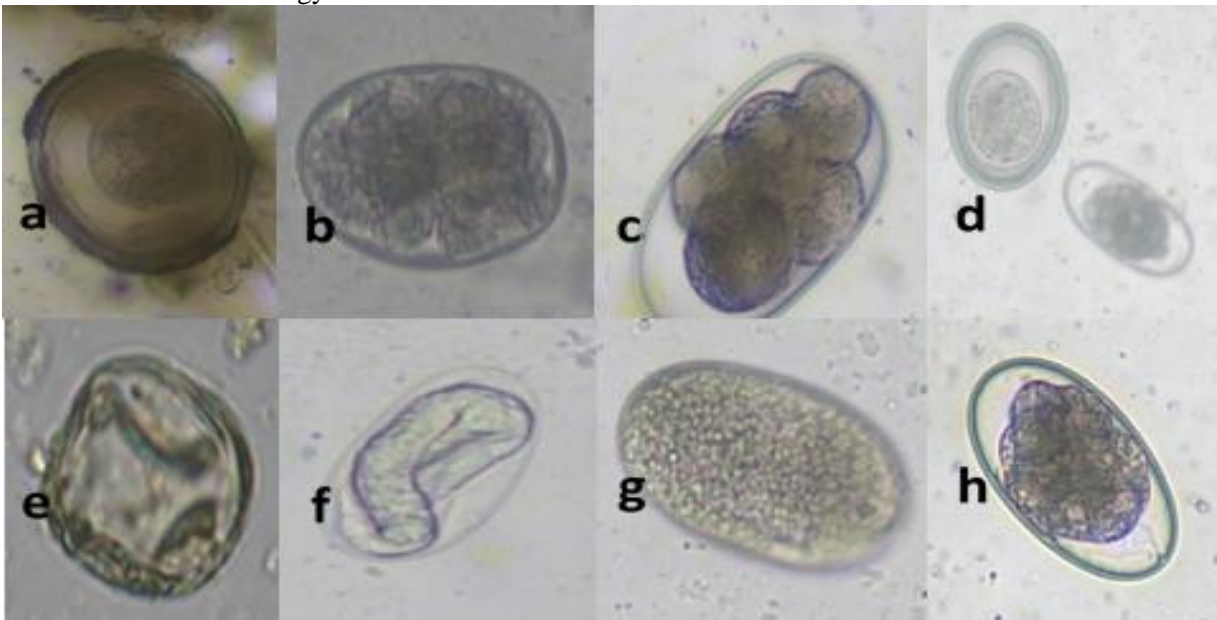
Table 3: Burden of multiple helminth species infection according to age, sex and body condition (n=400)

Risk factor (n)	<i>Strongyle</i> and <i>Nematodirus</i>	<i>Strongyle</i> and <i>Ascaris</i>	<i>Strongyle</i> and <i>Moniezia</i>	<i>Strongyle</i> and <i>Parascaris</i>	<i>Strongyle</i> and <i>Paramphistome</i>	<i>Strongyle</i> and <i>Nematodirus</i> and <i>Ascaris</i>	<i>Strongyle</i> and <i>Nematodirus</i> and <i>Moniezia</i>	<i>Strongyle</i> and <i>Nematodirus</i> and <i>Parascaris</i>	<i>Strongyle</i> and <i>Nematodirus</i> and <i>Paramphistome</i>	<i>Strongyle</i> and <i>Ascaris</i> and <i>Parascaris</i>	<i>Strongyle</i> and <i>Ascaris</i> and <i>Paramphistome</i>	<i>Strongyle</i> and <i>Moniezia</i> and <i>Parascaris</i>	<i>Strongyle</i> and <i>Moniezia</i> and <i>Paramphistome</i>	<i>Strongyle</i> and <i>Parascaris</i> and <i>Paramphistome</i>
Age														
Adult (400)	204 (51.0)	42 (10.5)	9 (2.3)	183 (45.8)	241 (60.3)	20 (5.0)	02 (0.5)	84 (21.0)	119 (29.8)	21 (05.3)	20 (5.0)	3 (0.8)	05 (01.3)	97 (24.2)
Sex														
Male (244)	116 (47.5)	20 (8.2)	6 (2.5)	112 (45.9)	146 (59.8)	9 (3.7)	2 (0.8)	48 (19.7)	69 (28.3)	12 (4.9)	8 (3.3)	1 (0.4)	3 (1.2)	60 (24.6)
Female (156)	87 (55.8)	24 (15.4)	02 (1.3)	70 (44.9)	95 (60.9)	12 (7.7)	0 (0.0)	35 (22.4)	47 (30.1)	10 (6.1)	13 (8.3)	2 (1.3)	2 (1.3)	37 (23.7)
Body condition Score														
BC3 (310)	156 (50.3)	29 (9.4)	09 (2.9)	138 (44.5)	192 (61.9)	15 (4.8)	2 (0.7)	62 (20.0)	91 (29.4)	15 (4.5)	14 (4.5)	3 (1.0)	5 (1.6)	83 (26.8)
BCS 2(90)	47 (52.2)	13 (14.4)	0 (0.0)	45 (50.0)	51 (56.7)	05 (5.6)	0 (0.0)	22 (24.4)	28 (31.1)	6 (6.7)	6 (6.7)	0 (0.0)	0 (0.0)	14 (15.6)

Helminth species identified in gastrointestinal tract of donkeys

Different species of gastrointestinal helminth that had infected into different parts of the gastrointestinal tract were the nematodes which includes Strongyles, *Parascaris*, *Ascaris* and *Nematodirus*. The trematodes were Paramphistome while cestode was *Moniezia* according to their eggs morphology (Figure 2). The relative frequency of single infection ranged from 100% seen in Strongyle to 0.5% as seen in

Moniezia in the samples taken from the rectum, 73% in Strongyle to 6% as was observed with *Parascaris* in the samples from caecum and 75.5% in Strongyle to 3.3% as seen in *Parascaris* for the samples from the small intestine (Table 4). Comparison of magnitude of helminth positive recovery based on part of gastrointestinal tract showed that rectum had higher recovery rate (88.4%) than the small intestine (43.3%) and caecum (42.9%).



a = *Ascarid* spp; **b** = *Gastrodiscus* spp; **c** = *Nematodirus*;
d = *Parascaris* and *Strongyle* spp; **e** = *Moniezia*;
f = *Dictyocaulus* spp; **g** = *Strongyloides* spp; **h** = *Triodontophorus* spp.

Figure 2: Different helminths species eggs identified after floatation and sedimentation of GIT contents of slaughtered donkeys.

Table 4: Prevalence of gastrointestinal helminths and species in different parts of gastrointestinal tract of donkey (n=400)

Category	Number of positive samples	Percent
Rectum		
<i>Strongyle</i>	400	100
<i>Paramphistome</i>	220	55
<i>Nematodirus</i>	204	51
<i>Parascaris</i>	193	45.75
<i>Ascaris</i>	42	10.5
<i>Moniezia</i>	2	0.5
Total	1061	88.4
Small intestine		
<i>Strongyle</i>	302	75.5
<i>Nematodirus</i>	204	51
<i>Parascaris</i>	13	3.3
Total	519	43.3
Caecum		
<i>Strongyle</i>	292	73
<i>Nematodirus</i>	199	49.75
<i>Parascaris</i>	24	6
Total	515	42.9

Quantification of different species of helminths in gastrointestinal tract of slaughtered donkeys

Table 5 shows the extent of helminth infections and the worm burden of different species.

Strongyles had the mean 1885 ± 1228 EPG which was the highest with the egg count ranging from 100 to 6500 per gram of faecal sample. *Moniezia* had the lowest EPG of 100.

Table 5: Magnitude of helminth infection and mean egg per gram (EPG)

Helminth species	Number (%) infected	Mean EPG	Minimum	Maximum
Strongyles	400 (100.0)	1885 ± 1228	100	6500
<i>Nematodirus</i>	195 (48.8)	384 ± 417	100	2900
<i>Ascaris</i>	44 (11.0)	225 ± 94	100	500
<i>Moniezia</i>	2(0.5)	100 ± 0	100	100
<i>Parascaris</i>	185(46.3)	570 ± 460	100	2300

Rectal faecal egg quantification showed that most donkeys (57.8; n=231) had severe levels of *Strongyle* infection which the EGP was above 1,500. However, most donkeys had less magnitude

of infection by *Nematodirus*, *Parascaris*, *Ascaris* and *Moniezia* (Table 6).

Table 6: Gastrointestinal helminths infection as determined by EPG from rectum samples

Helminths species	Number of positives (%)	EPG (Number of eggs per gram)			
		Less (<500)	Mild (>500)	Moderate (>800)	Severe (>1500)
Strongyle	400 (100.0)	66 (16.5)	48 (12.0)	55 (13.8)	231 (57.8)
<i>Nematodirus</i>	200 (50.0)	161 (40.3)	16 (4.0)	15 (3.8)	8 (2.0)
<i>Parascaris</i>	187 (46.8)	97 (24.3)	47 (11.8)	30 (7.5)	13 (3.3)
<i>Ascaris</i>	45 (11.3)	43 (10.8)	2 (0.5)	0 (0.0)	0 (0.0)
<i>Moniezia</i>	1 (0.3)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)

Recovery of adult helminth from the gastrointestinal tract

Several species of adult gastrointestinal helminths were isolated from different parts of the GIT (Figure 3). From the rectum, recovery involved five types of helminths namely large strongyles,

Parascaris, *Gastrodiscus*, *Gasterophilus* and *Paraphistomum* while recovery from small intestines involved three types which included *Strongylus*, *Triodontophorus* and *Cyathostomum*. The caecum had *Strongylus*, *Parascaris*, *Cyathostomum* and *Triodontophorus*.

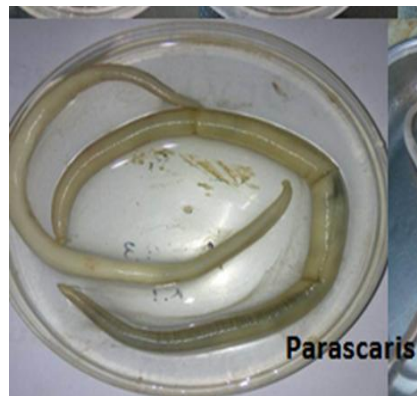


Figure 3: Some of the recovered adult worm from the GIT of donkeys.

Analysis for risk factors identified

Analysis for significance of helminths infections according to sex, donkey body score and parts of gastrointestinal tract is shown in Table 7. It was established that different GIT parts influenced the

colonization of different species of helminths ($\chi^2 = 282.53$; $p=0.000$). Sex and body score of donkeys had no influence on helminths infection and there was no significant difference ($p>0.05$) (Table 7).

Table 7: Analysis for significance of helminths infections according to sex, donkey body score and parts of gastrointestinal tract

Helminth species	Factor considered	Type III Sum of Squares	df	Mean Square	F	Sig.
<i>Strongyle</i>	Sex	0.172	1	0.172	0.730	0.393
	Body score	0.001	1	0.001	0.005	0.943
	GIT part	51.049	1	51.049	136.880	0.000
<i>Nematodirus</i>	Sex	3.171	1	3.171	13.485	0.000
	Body score	0.980	1	0.980	5.786	0.016
	GIT part	0.055	1	0.055	0.148	0.700
<i>Parascaris</i>	Sex	0.009	1	0.009	0.038	0.845
	Body score	0.266	1	0.266	1.567	0.211
	GIT part	34.609	1	34.609	92.798	0.000
<i>Ascaris</i>	Sex	0.528	1	0.528	2.246	0.134
	Body score	0.165	1	0.165	0.976	0.323
	GIT part	9.851	1	9.851	26.414	0.000
<i>Moniezia</i>	Sex	0.013	1	0.013	0.056	0.813
	Body score	0.391	1	0.391	2.310	0.129
	GIT part	1.987	1	1.987	5.329	0.021
<i>Paraphistomum</i>	Sex	0.065	1	0.065	0.276	0.600
	Body score	0.399	1	0.399	2.356	0.125
	GIT part	80.644	1	80.644	216.233	0.000

a. R Squared = 0.014 (Adjusted R Squared = 0.009)

b. R Squared = 0.010 (Adjusted R Squared = 0.005)

c. R Squared = 0.442 (Adjusted R Squared = 0.440)

DISCUSSION

The results obtained from slaughtered donkeys at Huacheng international abattoir, Dodoma Tanzania showed that, donkeys were infected with a wide range of gastrointestinal helminths including nematodes, cestodes, and trematodes by which the prevalence based on different parts of the GIT was 88.4%, 43.3% and 42.9% from rectum, small intestine and caecum respectively. This implies that the donkeys are affected by helminths which may have direct effect on their body conditions, performance as draught animals and the general welfare of donkeys. The observed prevalence during this study is agreement with the early reports from different countries in Africa (Gulima, 2006; Gebreyohans *et al.*, 2017; Alemayehu and Etaferahu, 2013; Yoseph *et al.*, 2001; Mezgebu *et al.*, 2013; Ayele *et al.* 2006; Mulate, 2005). This further support the assertion that donkeys are given less attention including routine veterinary care like deworming (Marshall and Ali, 2004; Swai and Bwanga, 2008).

The quantitative faecal examination showed that helminthosis was an important health problem in the donkeys. Mixed infections were detected in 69.4% of the donkeys. Based on the severity index defined by Soulsby (1982), 30.3% of donkeys sampled were severely infected, 12.0% moderate infected, 13.6% mildly infected & 44.2% less infected. Additionally, *Strongyles* mean egg count was 1885 ± 1228 per gram of faecal sample which was the highest, similarly, rectal faecal sample quantification analysis showed that most donkeys had severe levels of *Strongyle* infection, however, *Nematodirus*, *Parascaris*, *Ascaris* and *Moniezia* were at low levels. Elsewhere, different levels of EPG in donkeys were reported but are always at severe levels (Yoseph *et al.*, 2015, Gianfaldon *et al.*, 2020; Papini *et al.*, 2020; Mathewos *et al.*, 2021). Heavy worm infestations in donkeys suggest significant economic losses evidenced by decreased performance of donkeys, poor growth rate, reduced weight gain and sometimes death especially in young donkeys (Yoseph *et al.*, 2015). The observed higher helminthosis in donkeys

could be attributed to the fact the animals may have not been dewormed in their lifetime, so there has been a build-up of helminths for their entire period of their age (Alemayehu and Etaferahu, 2013). It is important that donkeys should be dewormed and cared in similar way as other domestic animals.

It was further established that *Strongyles* eggs were predominantly found as single infection and the most encountered species among nematodes as previously reported by other scholars (Yoseph *et al.*, 2001; Mulate, 2005; Ayele *et al.*, 2006; Getachew *et al.*, 2010; Fikru *et al.*, 2005). This suggests that *Strongyles* are the common helminths that affect donkeys in Tanzania. Further, all the cases of mixed infestation involving two or more species of helminths were found to be infected commonly with strongyles and other one or two helminths species ranging from 60.3% *Strongyle* + *Paramphistomes* to 0.5% *Strongyle* + *Nemaodirus* + *Moniezia*, which could be attributed to the fact that the genera of roundworms have direct life cycle with their free living larvae having more or less same bionomics. *Paramphistomes* was also concurrently involved indicating water reservoir infested with *Indoplanorbis* spp. of snail which is a common intermediate host of trematodes. In this study *Paramphistomum* species was 55% which is relatively higher than other studies (Ayele *et al.*, 2006; Getachew *et al.*, 2010; Fikru *et al.*, 2005).

The prevalence of *Parascaris equorum* was 45.8% which agrees with other reports elsewhere which reported similar range of infections (Ayele *et al.*, 2006; Mulate, 2005; Mezgebu *et al.*, 2013; Gebreab, 1998; Getachew *et al.*, 2008). However, other studies reported low infections rates of 15.7% and 17.3% of *Parascaris equorum* in working donkeys (Yoseph *et al.*, 2001; Fikru *et al.*, 2005). The differences in prevalence of GIT helminths may arise due to differences in environmental conditions that are conducive for the perpetuation of the parasite and the laboratory methods in the analysis.

The current study observed *Gastrophilus* larvae at infection rate of 17.6%. This result is in relatively

agreement with the study by Getachew *et al.* (2010) and Ayele *et al.* (2006) who reported *Gastrophilus* larva infection rate of 20.9% to 30%, however, other studies reported low infection rate of 2.5% to 5.8% (Mezgebu *et al.*, 2013; Gebreyohans *et al.*, 2017; Yoseph *et al.*, 2001). Variations in *Gastrophilus* larva infection rates might be due to the difference in the season of the study and environmental difference between the study areas.

In this study, body condition score was not significantly associated ($P > 0.05$) with infection rate since all donkeys with poor and good body condition were equally infected with helminths. This was in contrast with other studies on donkeys which reported statistically significant difference in body condition score with helminths infection rates (Ayele *et al.*, 2006; Mezgebu *et al.*, 2013; Samuel *et al.*, 2015; Yoseph *et al.*, 2001; Worku and Afera, 2012; Bakwetu and Endalkachew, 2013; Tesfu *et al.*, 2014; Ibrahim *et al.*, 2011). It is known that poor body condition score is caused by multiple causes including chronic health problems like helminthiasis. Lack of statistical significance may partly be due to having uniform infection to almost all donkeys which may have developed tolerance on helminths such that they don't affect their body condition.

It was further found that GIT parts influenced helminth species colonization and the difference in infection rates was statistically significant ($p < 0.05$) between GIT parts. Rectum was observed to contain higher rates of helminths colonization than the small intestine and caecum. This might be because it is the last part of the GIT and that whatever helminth that may be in the upper parts can easily be taken downstream of the gastrointestinal track by peristalsis to the rectum before are shaded out in faeces either as eggs or adult worms. This may account for the differences in the observed helminths recovery rate along different parts of the GIT. However, the parasites may have preferences to the site. More studies are recommended before concluding that the rectum as the preferred gastrointestinal track site by helminths.

CONCLUSION AND RECOMMENDATIONS

The present study conducted on donkeys GIT helminths parasites at Huacheng International Abattoir revealed a high prevalence of a wide range of species of GIT helminths parasites as an

important health problem and welfare of animals. Donkeys need good livestock husbandry practices and routine veterinary services including deworming.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

FUNDING

This research did not receive any specific grant from funding any agencies.

AUTHOR'S CONTRIBUTIONS

Conceptualizing of research idea, writing of proposal, data collection and drafting of manuscript – RGM. Supervision of the whole research, data analysis and interpretation, review

and perfection of manuscript – NJ, HEN. All the authors have read and agreed to the published version of the manuscript.

ACKNOWLEDGEMENTS

We thank management of Huacheng International Abattoir for accepting this study to be conducted at their facility. The laboratory technicians at LITA Mpwapwa, Visele Livecrop Skills Training

Centre at Mpwapwa and Helminthology Laboratory at Sokoine University of Agriculture are thanked for their technical support during laboratory analysis.

REFERENCES

- Alemayehu, R. and Etaferahu, Y. (2013). Gastrointestinal Parasites of Equine in South Wollo Zone, North Eastern Ethiopia. *Glob VeterinariNortheastern*-830.
- Asefa, Z., Kumsa, B. Endebu, B., Gizachew, A. Merga T. and Debela, E. (2011). Endoparasites of Donkeys in Sululta and Gefersa Districts of Central Oromia, Ethiopia, *J Anim Vet Adva*, 10(14): 1850-1854.
- Ayele, G., Feseha, G., Bojia, E. and Joe, A. (2006). Prevalence of gastro-intestinal parasites of donkeys in Dugda Bora District, Ethiopia. *Livest Res Rural Develop. Volume 18, Article #136*. Retrieved November 15, 2025, from <http://www.lrrd.org/lrrd18/10/ayel18136.htm>
- Bewketu, T. and Endalkachew, N. (2013). Prevalence of Gastrointestinal helminthes of Donkeys and mules, *Ethiopian Vet J*, 17(1):13-30.
- Burden F. A., Du Toit N., Hernandez-Gil M., Prado-Ortiz O. and Trawford A. F. (2010). Selected health and management issues facing working donkeys presented for veterinary treatment in rural Mexico: some possible risk factors and potential intervention strategies. *Trop Anim Health Prod*, 42(4): 597–605.
- Daniel, W.W., (editor). (1999). *Biostatistics: a foundation for analysis in the health sciences* seventh edition. New York: John Wiley & Sons; [<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4017493>]
- Fikru, R., Reta, D., Teshale, S. and Bizunesh, M. (2005). Prevalence of equine gastrointestinal parasites in western highlands of Oromia. *Bull Anim Health Prod Africa*, 53: 161-166.
- Gebreab, F. (1998). Helminth parasites of working equids; the African perspective. In: *Proceedings of 8th International Conference on Equine Infectious Diseases*, Dubai, 318-324.
- Gebreyohans, A., Abrehaley, A., Kebede, E. (2017). Prevalence of gastrointestinal helminthes of donkey in and around Mekelle. *Natl. Sci.* 15, 42–57.
- Getachew, M., Feseha, G., Trawford A. and Reid, S.W. (2008). A survey of seasonal patterns in strongyle faecal worm egg counts of working equids of the central midlands and lowlands, Ethiopia, *Trop Anim Health Prod*, 40: 637-642.
- Getachew, M., Trawford, A., Feseha, G., and Reid, S.W.J. (2010). Gastrointestinal parasites of working donkeys of Ethiopia. *Trop Anim Health Prod*, 42: 27-33.
- Getachew, A.M., Burden, F. and Wernery, U. (2016). Common infectious diseases of working donkeys: their epidemiological and zoonotic role. *Journal of Equine Veterinary Science*, 39: S98eS107.

- Gianfaldoni, C., Barlozzari, G., Mancini, S., Domenico, E.D., Maestrini, M. and Perrucci, S. (2020). Parasitological investigation in an organic dairy donkey farm. *Large Animal Review* 2020; 26: 25-30.
- Gulima, D. (2006). Epidemiological study of helminthosis in traction and horses in Awi Zone, Nourth Western, Ethiopia, *Vet J*, 10: 37-54.
- Hansen, J. and Perry, B. (1990). The epidemiology, diagnosis and control of gastrointestinal parasites of ruminants in Africa. Nairobi, Kenya. *Intern Lab Res Anim Dis*, p. 107
- Ibrahim, N., Berhanu, T., Deressa, B. and Tolosa, T. (2011). Survey of prevalence of helminth parasites of donkeys in and around Hawassa town, Southern Ethiopia, *Glob Veterin*, 6(3): 223–227.
- Marshall, K. and Ali, Z. (2004). Donkeys, People and Development *In: A resource book of the animal traction network for eastern and Southern Africa* (ATNESA). Edited by (Fielding and Starkey, P), Technical center for agriculture and rural cooperation (CTA), Wageningen, The Netherlands, pp. 77-81.
- Mathewos, M., Fesseha, H., and Yirgalem, M. (2021). Study on Strongyle Infection of Donkeys and Horses in Hosaena District, Southern Ethiopia. *Vet Med: Res Reports*, 12: 67 – 73, 2021.
- Mezgebu, T., Tafess, K. and Tamiru, F. (2013). Prevalence of Gastrointestinal Parasites of Horses and Donkeys in and around Gondar Town, Ethiopia, *Open Journal of Veterinary Medicine*, 3: 267-272.
- MLF (2021) Ministry of Livestock and Fisheries Budget Speech. <https://www.mifugouvuvuvi.go.tz/>
- Muleta, B. (2005). Preliminary study on helminthosis in equines in South and North Wollo zones, Ethiopia, *J Vet Assoc*, 9(2): 25-37.
- Papini, R.A., Orsetti, C. and Sgorbini, M. (2020). A controlled study on efficacy and egg reappearance period of ivermectin in donkeys naturally infected with small *Strongyles*. *Helminthologia*, 23;57(2):163–170, 2020. doi: [10.2478/helm-2020-0017](https://doi.org/10.2478/helm-2020-0017)
- Samuel, E., Ashenafi, A., Natnael, and Shiret, B., (2015). Prevalence of gastrointestinal nematode parasitic infections of horse and donkeys in and around Kombolcha town. *American-Eurasian J Scient Res*, 10(4): 228-234, 2015.
- Segwagwe, B.V.E. Aganga, A.A. and Patrick, C. (1999). Investigation into the common diseases of donkeys (*Equus asinus*) in Botswana; Proceedings of the workshop of the Animal Traction Network for Eastern and Southern Africa (ATNESA), Mpumalanga, South Africa. p.344.
- Soulsby, E. J. L (1982). Helminths, Arthropods and Protozoa of domesticated animals. 7th edition, Lea Febiger, Philadelphia, pp:136-328.
- Svensden, E. D. (1997). Parasites abroad. The professional handbook of the donkey, 3rd edition. Whittet Books Limited, 18 Anley Road, London W14 0BY, p.166-182.
- Swai, E.S. and Bwanga, S.J.R (2008). Donkey keeping in northern Tanzania: socio-economic roles and reported husbandry and health constraints. *Lives Res Rural Develop*, 20(5).
- Tanzania National Livestock Policy (2006), p. 21. <https://www.mifugouvuvuvi.go.tz/>
- Tesfu, N., Asrade, B., Abebe, R. and Kasaye, S., (2014). Prevalence and risk factors of gastrointestinal nematode parasites of horse and donkeys in Hawassa town, Ethiopia, *J. Vet Science & Technol*, 5(5).
- Worku, S. and Afera, B. (2012). Prevalence of equine nematodes in and around Kombolcha South Wollo, Ethiopia, *Revista Electrónica de Veterinaria*, 13: 1–13.
- Yoseph, S., Feseha, G. and Abebe, W. (2001). Survey on helminthosis of equines in Wenchi. *Journal of Ethiopian Veterinary Association* 5: 47-61.
- Yoseph S., Smith D.G., Mengistu A., Teklu F., Firew T. and Betere Y. (2015). Seasonal variation in the parasite burden and body condition of working donkeys in East Shewa and West Shewa regions of Ethiopia. *Trop Anim Health Prod, Suppl* 1:35-45, 2015. doi: 10.1007/s11250-005-9004-3.