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Status of Helminthes Parasites of Cattle in Dairy Farms of Holleta Agricultural Research Center, Central Ethiopia

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Abstract

A cross-sectional study was under taken at dairy farms of Holleta Agricultural Research Center, Central Ethiopia, which was located at central highland of Oromia special zone surrounding Finfinne, to determine the prevalence of gastrointestinal helminthes parasites of cattle from October 2009 to June 2010. A total of 283 cattle were examined using standard coprological examination on 147 Boran × Fresia and 136 Jersey breed cattle from both farms. The over all prevalence of GI helminthes parasites was found to be 68.2% (193/283) with the predominant eggs of *paramphistomum* (18.0%) followed by *ascaris* (9.5%), *fasciola* (8.5%), *strongylus* (7.1%), *nematodirus* (6.7%) and *trichuris* (1.8%) obtained from the study. There was statistical significant difference between age, breed and body condition with prevalence of parasites (P<0.05). The higher prevalence was recorded from adult animals than in young group. A cross breed of Boran × Fresia had higher prevalence of 57% than that of pure Jersey (43.0%). The level of infections determined by using Mc Master Eggs counting indicated that mild infections accounted for 55.5%, sever 1.1% and 11.7% for sub clinical light infections. Based on the results obtained further study on determinant factors for the occurrence of helminthes parasites and implementation of appropriate control and prevention methods should be applied in study area.

Keywords: Gastrointestinal helminthes parasites; Dairy cattle; Prevalence; Holetta; Ethiopia

Introduction

In Ethiopia Livestock playing an important role in the livelihood of poor farmers and provide a vast range of products and services such as meat, milk, skin, hair, horns, bones, manure and urine, security, gifts, religious rituals and medicine [1]. Livestock diseases are one of the main production constraints in which helminthes parasites are among the biggest causes of production losses and are responsible for both direct and indirect losses [2]. Helminthiasis of domestic animals is of major importance in many agro-ecological zones in Africa, but their impact is greater in Sub-Saharan Africa in general and Ethiopia in particular [3].

The most important helminthes parasites in cattle include nematodes (round worms), trematodes (flukes) and cestodes (tape worms). These parasitic infections are problem for both small- and large-scale farmers worldwide, but their impact is greater in sub-Saharan Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species [4].

Gastrointestinal helminthes are one of the main problems to cause economic losses and disease in animals. The effect of infection is determined by a combination of factors of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasites interaction and the infective dose are the most important. The direct losses caused by these parasites are attributed to acute illness and death, premature slaughter and rejection of some parts during meat inspection. Indirect losses include the diminution of productive potential such as milk production reduce in dairy cow, decrease growth rate, weight loss in young growing calves and late maturity of slaughter stock [5].

The pathogenic effect of gastro-intestinal parasites may be sub-clinical or clinical. Young animals are most susceptible. The effect of these parasites is strongly dependent on the number of parasites and the nutritional status of the animals they are infecting. The major clinical signs are weight loss, reduced feed intake, diarrhea, and mortality reduced carcass quality and reduced wool production/quality [6]. Young animals do not have a great deal of immunity to parasites during their first year at pasture. The second year, they have partial immunity and, although they may appear healthy, they eliminate many eggs. Adult animals are much less susceptible to most parasites, unless they are in poor living conditions [5].

Animals are sometimes kept in conditions that make them highly susceptible to parasites. In the case of a recently dewormed animal, internal parasites no longer exist. There is thus no equilibrium and such an animal put into a contaminated pasture may be seriously affected. Animals in poor condition (e.g., recent illness, food shortages) are also highly susceptible [7].

Previous reports on prevalence of helminthes parasites of cattle in different areas of Ethiopia showed that 71%, 82.8%, 50.2%, 54.4%, 47.1% and 77.6% which is reported by Manaye [8] from highlands of Asela and its surrounding, Estehewot [9] in dairy cows in and around Holleta, Fikru et al. [10] in Western region of Oromia, Berhanu [11] in West Shoa zone, Ephrem [11] in Addis Ababa dairy farms and Cherinet [12] in small holder dairy farms of Jimma town respectively. Continuous investigation of parasitism in specific area is important to

know its status for implementation of control and prevention strategies based on its determinant factors. Therefore the aim of the present study was to determine the status of helminthes parasites of cattle and its associated risk factors and to identify major GI helminthes affecting dairy cattle of Holleta agricultural research center, central Ethiopia.

Materials and Methods

Study area

The study was conducted at Holetta and Adea Berga dairy farms of Holleta Agricultural Research center (HARC), which is located about 29 km from Addis Ababa on the highway of Ambo road. Holetta is located in central highland of Oromia special zone surrounding - 9°15' N and longitude of 38°25'- 38°45' E, at altitude of 2060-3380 m above sea level. The area got annual rain fall in between 834-1300 mm and the annual temperature of 11-22°C. Rainy season occurs with bimodal distribution 70% of which occurs during the main rainy season (June to September) and 30% during the small rainy season (February to April) and relative humidity of 50.4%.

Study animals

The Study animals were cross-breed of the number of Boran × Friesian cattle and Jersey breed which were kept under semi-intensive management system by Holleta Agricultural Research center in two separate places. The farm of cross-breed were located in Holleta town where the main office of the center found and Jersey breed farm at about 20 km from the center in Adea berga District. A total of 283 cattle with different age groups were included in this study. The age and other related factors of individual animals were collected from record of the center. Body condition score was determined as described by Morgan [13] and further classified into poor, medium and good. The purposes of these farms were for breed improvement and increasing of milk production requirement by the country.

Sample size determination

The sample size was determined at 95% confidence interval, 5% precision and with an expected prevalence of 50%. Thus, the sample size value was read from Thrusfield [14] and calculated to be 384 animals; however for this particular study we have used 283 animals based on facilities and animal management during the study period. Simple random sampling was considered to select the animals from the two farms of the study area where there was small herd size of animals existed in the farms.

Study design

A cross sectional study type was carried out from October 2009 to June 2010 to determine the prevalence of gastrointestinal helminthes of cattle in dairy farms of Holetta Agricultural research center using different coprologic techniques like flotation, sedimentation and Modified Mc master egg counting. The study cattle were selected by simple random sampling method and fecal sample was collected from the selected animals. Each selected animals for study was identified by their code.

Sampling method

The fecal samples were collected directly from rectum of the selected animals or from the top layers of fresh voided feces with a labeled disposable container by the animals' identification code number. Then the sample transported to HARC Parasitology laboratory immediately after collection and stored in a refrigerator at 4°C at maximum for 24

hours only. During the sample collection the breeds of animals, age and code given for individual animals as well as sample collection date were recorded for each sampled animals. Also their body conditions were registered. The sample was collected from the dairy farm cattle with use of simple random methods.

Fecal examination/coprology

To investigate the eggs of the helminthes each fecal sample collected were processed by using standard flotation and sedimentation techniques [15]. Identifications of eggs also made on the basis of their morphology according to keys given by Soulsby [15]. Modified Mc master egg count techniques (used for fecal samples that were positive to the parasite; to identify the degree of infestation) and levels of the worm infection were extrapolated from severity index defined by Urquhart et al. and Smith et al. [16,17], where cattle was said to have low, moderate and severe infestations if their fecal egg counts were from 100-250, 250-400 and more than 400 respectively.

Statistical analysis

The data collected from the study area was coded and recorded in Microsoft excel spread sheet and then analyzed by using SPSS version 16. The prevalence was calculated by dividing the number of animals harboring a given parasite by the total number of animals examined. Percentage to measure the prevalence of helminthes and chi-square (χ^2) to measure association between prevalence of the helminthes and the breeds, age, and body conditions of animals were the statistical tools applied. In all the analyses, confidence level was held at 95% confidence level and P<0.05 were set for significance value.

Results

Of the total 283 cattle (Boran × Fresian and Jersey) examined, 68.2% were found to harbor one or more gastrointestinal parasites. The prevalence of gastrointestinal parasites was higher in Borena × Fresian 57% (110/193) than Jersey 43% (83/193) (Table 1).

The predominant helminthes, eggs identified were nematodes eggs (52.3%), trematodes (37.8%) and mixed infections were found to be rare in occurrence (9.8%) as shown in Table 2.

The major species of helminthes parasites identified in this study were *Paramphistomum* at rate of 18% (51/193), followed by *Ascaris* 9.5% (27/193), *Fasciola* spp.8.5% (24/193) and the least percentage were *Trichuris* spp. which accounted for 1.8% (5/193) even mixed infection of those others occurred (Table 3).

The prevalence study in the different age groups was also conducted and it was observed to be 7.8%, 13.0%, 42.5% and 36.8% in age categories of less than 6 months, 6 months to 1 year, Heifers and bulls and milking cows respectively. There was statistically significant difference among the age groups (χ^2=69.278, P=0.002) as shown in Table 3. Higher prevalence rate was shown in adult animals than young.

There were a significant difference in prevalence of parasites with body condition of the animals observed (χ^2=7.950, p=0.019). A higher prevalence rate was encountered in animals with poor body condition 62.7%, while 16.1% and 21.2% were in animals with medium and good body condition respectively (Table 3). The statistical analysis in between breeds of animals showed that there was significance difference (χ^2=8.830, P=0.032) with the prevalence of helminthes parasites (Table 4).

The greater proportion of the study cattle (55.5%) were with moderate EPG, while (11.7%) and were with severe EPG infection rates (1.1%). Statistically significant (P<0.05%) association was also revealed

Type of parasites	Breed		
	Borana × Friesian N (%)	Jersey N (%)	Total N (%)
Nematodes	42 (21.8)	59 (30.6)	101 (52.3)
Trematodes	53 (27.5)	20 (10.4)	73 (37.8)
Mixed infection	15 (7.8)	4 (2.1)	19 (9.8)
Over all	**110 (57)**	**83 (43)**	**193 (100)**

N=Number of positive

Table 1: Prevalence of major helminthes parasites among breeds of Cattle in the study area.

Species of parasites identified	No. Positive	Percent (%)	Boran × Fresia (%)	Jersey (%)
Strongylus	20	7.1	9(6.1)	11(8.1)
Ascaris	27	9.5	11(7.5)	16(11.8)
Nematodirus	19	6.7	2(1.4)	17(12.5)
Trichuris	5	1.8	2(1.4)	3(2.2)
Paramphistomum	51	18	47(32.0)	4(2.9)
Fasciola	24	8.5	7(4.8)	17(12.5)
Nematodirus & ascaris	23	8.1	14(9.5)	9(6.6)
Strongylus & ascaris	2	0.7	2(1.4)	0
Fasciola & ascaris	7	2.2	3(2.0)	4(2.9)
Trichuris & ascaris	2	0.7	0	2(1.5)
Paramphistomum and ascaris	9	3.2	9(6.1)	0
Paramphistomum and fasciola	2	0.7	2(1.4)	0
Paramphistomum, fasciola & ascaris	2	0.7	2(1.4)	0
Overall	**193**	**68.2**	**110(57%)**	**83(43%)**

Table 2: Species of helminthes parasites identified from different cattle breeds.

Factors	No. of animals examined	No. Positive (%)	X^2	P-Value
Age				
<6 months	25	15(7.8)		
6 months to1year	42	25(13.0)	69.278	0.002
Heifers and bulls	110	82(42.5)		
Milking cow	106	71(36.8)		
Body condition				
Poor	164	121(62.7)		
Medium	45	31(16.1)	7.950	0.019
Good	74	41(21.2)		
Breed				
Boran × Fresia	147	110(57)	8.830	0.032
Jersey	136	83(43)		

Table 3: Prevalence of GI helminthes Parasites within different risk factors.

in parasite prevalence between the different cattle breeds as shown in Table 4.

Discussion

Gastrointestinal parasites are highly prevalent in cattle where grazing pastures are dominant feed resources. Moreover, the study indicated a high prevalence and wide distribution of trematodes and moderate prevalence of gastrointestinal nematodes. The overall prevalence of helminthes infection of cattle in the present study was (68.2%) which almost in line with prevalence reported by Manaye [8] in highlands of Asela and its surrounding (71%) and also by Tesfaye [4] in dairy cattle of south Wello who reported 60%. The present study was lower as compared to the prevalence of GI helminthes obtained in dairy cows by Cherinet [12] and Estehewot [9] who indicated 77.6% in small holder dairy farms of Jimma town and 82.8% in dairy cows in and around Holleta respectively. The preset study was higher as compared

to the prevalence of GI helminthes obtained by Ephrem [18] in Addis Ababa dairy farms; Dejene [19] in Tulo district, Western hararghe zone; Mohammed [20] in Jimma areas; Berhanu [11] in West Shoa zone who reported as 47.1%, 50.8%, 53.9%, 54.4% respectively. Differences in the prevalence of GI parasite between the different studies could be due to variations in deworming practices, sample sizes, the parasitological techniques utilized, management conditions and climate between the studies areas including breed of cattle considered.

The predominant GI helminthes parasites identified in this study indicated higher prevalence of nematode parasites at 52.3% than trematodes 37.8%, whereas 9.8% were mixed infections of the two. This is consistent with findings of [21] in Burkina Faso, but disagreed with the reports of [9,22]. The major parasites species identified were *paramphistomum* (18.0%) followed by *Ascaris* (9.5%), *Fasciola* (8.5%), *Strongylus* (7.1%), *nematodirus* (6.7%), and *Trichuris* (1.8%) in which Infection with more than one helminthes occurred as well. Among the

Breed	No. of examined	Positive animals (%)	EPG Category (%)		
			Light	Moderate	Heavy
Boran × Fresian	147	110 (57%)	17(11.6%)	90(61.2%)	3 (2.0%)
Jersey	136	83(43%)	16(11.8%)	67(49.3%)	0%
Total	283	193(100%)	33(11.7%)	157(55.5%)	3(1.1%)

EPG=Egg per Gram

Table 4: Degree of nematode parasites infection among cattle breeds.

species highest prevalence of *paramphistomum* recorded by Manaye [8] had similar reports with the present study. The prevalence difference among the genera and species of helminths in different study area indicates that the topography and climatic condition of each study area vary from one another in supporting infectivity of different parasite and development of their intermediate hosts.

The prevalence study in different age group was conducted and it was observed to be the significantly higher prevalence rate was recorded in adult animals. This finding is in agreement with most literatures [7,23]. The age at which young animals are weaned is an important factor as regard to parasite resistance. For example, it has been observed that milk-fed calves are distinctly less contaminated than weaned calves [24]. The present report may oppose the idea of young animals do not have a great deal of immunity to parasites during their first year at pasture. The second year, they have partial immunity and, although they may appear healthy, they eliminate many eggs. Adult animals are much less susceptible to most parasites, unless they are in poor living conditions [5]. The present study concludes that less chance of exposure to infective stage of parasites by calves made less frequency of its occurrence than in adult animals.

The significant difference (χ^2=7.950, P=0.019) was observed in body condition of the animal and the prevalence of the parasites. The higher prevalence that observed in poor body conditioned animals was similar with the report of [7,10,25] could be due to GI nematodes and immunological responses of the animals against parasitic infections. This idea is in consistent with FAO [26] that started ruminants that are on a higher plane of nutrition mount a better immune response to internal parasites than whose nutritional status is compromised.

The study further revealed that breed of the animals showed significant association (χ^2=8.830, P=0.032) with the prevalence of the parasites; in which cross breed Boran × Fresian highly infected at rate of 51.9% than pure breed Jersey 48.1%. This association between different groups of breed and prevalence of parasites agrees with the study reported by Etsehiwot [9] and Berhanu [11] that stated there is a significant difference between the breed of the animals with prevalence of parasites.

The egg count per gram of feces for nematode infection in the current study indicated mostly with low to moderate intensity of infection. This result agrees with observation made by Berhanu, Dejene and Mohammed [11,19,20], who indicated the sub clinical cases of GI helminthes parasites with subsequent subsistent low pasture contamination.

Conclusion and Recommendations

Gastrointestinal helminthes parasites were one of the main problems in animals in dairy farms of Holleta agricultural research center. The most predominant GI helminthes parasites identified in this study was *paramphistomum* followed with *Ascaris* and *Fasciola*. Some of the cattle were affected with two or more parasites at a time. However, different ages, breeds and body conditions of animals had different chance to harbor the GI parasites. Generally the prevalence

of parasites was depending upon variations in deworming practices, sample sizes, climate conditions, and presence of intermediate host, feeding system, breeds and ages. Most of the animals examined during the present study relatively harbor low to moderate parasites eggs suggesting that the infection were usually sub clinical. However, sub clinical infections may be very important economically leading to retarded growth; reduced productivity and animals were more susceptible to other infections and infected animals also contaminate pastures. Therefore strategic parasitic control programs should be designed, so there should be further study on epidemiology and determinant factors for the occurrence of helminthes parasites and implementation of appropriate control and prevention methods for GI parasites identified that cause economic losses and diseases of animals in this study.

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