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Full Length Research Paper

A prevalence study of internal parasites infecting Boer goats at Adami Tulu Agricultural Research Center, Ethiopia

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This study determined the prevalence and intensity of internal parasites infecting pure- and cross-bred Boer goats, and to determine the risk factors associated with the parasites at Adami Tulu Agricultural Research Center, Ethiopia. The study covered five months from November 2009 to March 2010. During this period, faecal samples from 192 goats (104 pure Boer goats and 88 cross-bred goats) were examined using several carpological parasitological procedures. All goats were infected with at least one type of parasite. *Strongyloides* spp. (4.7%), *Moniezia* spp. (7.8%), *Skrjabinema* spp. (11.5%), strongyle -type species (49.5%) and *Eimeria* spp. (100%) were identified. *Eimeria* spp. was not affected by risk factors such as breed, age, sex and body condition score but breed and sex had a significant effect (p<0.05) on strongyle-type eggs. Similarly, age affected the prevalence of *Strongyloides* spp. (p<0.05). The faecal egg counts showed that these parasites may affect the growth rate of goats at the farm. Some recommendations are proposed for controlling the parasites on the farm.

Key words: Boar goat, cross-bred, *Eimeria,* internal parasites, *Moniezia,* prevalence, *Skrjabinema, strongyle-type, Strongyloides*.

INTRODUCTION

Small ruminants are important domestic animals in tropical production systems (Devendra and Meclorey, 1990). Within the African society, small ruminants contribute a greater proportion to the total wealth of poor families. This is because of low input requirements such as small initial capital, the need for fewer resources and maintenance costs. They also produce milk and meat in usable quantities using marginal lands, poor pastures and/or crop residues. Furthermore, the goats' reproductive cycle means only short periods are needed to rebuild flocks after disaster and responses to demand need to be quick (Getenby, 1991).

Sheep and goats are a major source of cash income and food protein for rural farmers in most parts of the tropics including Ethiopia (Ibrahim, 1998).

The estimated 46.9 million of small ruminants in Ethiopia (CSA, 2009) provide an important contribution to the national economy (Alemayehu et al., 1995). Although small ruminants represent a great resource for the nation, the productivity per animal is low. Small ruminant diseases, poor management and lesser efforts provided to improve the performance of the animals are to be responsible for the reduced productivity (Admosun, 1992). The Boer goat, a breed indigenous to South Africa, is gaining international recognition and is being exported worldwide (Malan, 2000). The reproductive

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performance of Boer goats has shown them to be superior in most aspects (Erasmus, 2000).

Because of their desirable genetic traits for meat production and hardiness to several diseases, Boer goats have successfully improved the productive and reproductive performance of indigenous breeds through cross-breeding. Most notable improvements included birth weight, growth weight, weaning weight, breeding weight, mature weight, kidding rate and carcass quality (Cameron et al., 2001).

Goats can be infected by numerous internal parasites; the effect of infection by gastrointestinal parasites varies according to the parasite(s) involved, the degree of infection and other factors. The two most important internal parasites are the protozoan coccidian (Dai et al., 2006) and the nematode *Haemonchus contortus* (Waller, 2004). Since Boer goats are newly introduced in parts of Ethiopia, no attempts have been made in the past to study the health aspect of these animals. Lack of well established data on the magnitude, distribution and predisposing factors of Boer goat GIT helminthes in Ethiopia in general and at the study area specifically initiated this study project. Therefore, the main objectives of this study were to study the prevalence of internal parasites infecting Boer goats at the Adami Tulu Agricultural Research Center and to determine the types of internal parasites present, their intensity and their associated risk factors.

MATERIALS AND METHODS

Description of study area

Adami Tulu Agricultural Research Center is located in the Mid Rift Valley, 167 km south of Addis Ababa. It lies at latitude 7°9'N and longitude 38°7'E. The land sits at an altitude of 1650 m above sea level and has a bimodal unevenly distributed average annual rainfall of 761 mm. The rainfall extends from February to September with a dry period from May to June, which separates the preceding 'short' rains from the following 'long' rains. The soil is fine sandy loam with sandy silt in the proportion of 34 and 40, respectively. The average soil pH is 7.88 and the total land area is 200 ha (Ebro et al., 1998).

Study animals and management

Adami Tulu Agricultural Research Center was established 40 years ago and consists of different agricultural and livestock farms. Included in its livestock farms is a newly established Boer goat farm, funded by the Ethiopian Sheep and Goat Productivity Improvement Program (ESGPIP). The goat farm was established in 2008 with 104 Boer goats that were brought from 10 different farms in South Africa .The purpose of the farm is to improve the meat and milk production of the local goat population by cross-breeding with the Boers.

The Boer males have been crossed with female local goats, particularly the Arsi-Bale breed. However, some female goats still mate with local male goats found on the farm after breaching the external fences of the goat farm. This has created unwanted offspring (kids) and the chance for disease transmission (including helminthes) between the indigenous and exotic breeds.

The farm is divided into two parts; the 'Nucleus' site and the 'breeding, evaluation and distribution' (BED) site in order to separate the pure and cross-bred goats from each other. Pure-bred Boer goats were housed on the nucleus site and the male Boer goats, Arsi-Bale, and crossed goats were housed on the BED sites with similar stocking rate. During the mating season, single pure male Boer goats were mated with 5 to 8 females from the BED site.

The goats were fed hay mixed with molasses. After feeding in the morning, they were allowed to graze grasses in their fenced areas, except those less than 2 months of age that suckled their mothers. If a kid's mother was unable to give milk, the kid received milk from other sources, e.g. cow's milk. The pure Boer goats consumed larger amounts of grasses compared to the local and cross-bred goats at this farm.

Description of study methodology

Study design and sampling method

Cross sectional study type was employed to determine the prevalence of the parasite through coproscopy and purposive type of sampling had been applied to include all Boer goats because of small number of animals found in the farm and in the country because the Boer goats were newly introduced in Ethiopia at the time of study.

Faecal sample collection

During the study period, from November 2009 to March 2010, 192 goats were sampled and faecal material was collected per rectum from each animal once per week and about 10 to 15 animals were sampled in each sampling day. Samples were transferred to faecal sample bottles and labeled (breed, age, sex, body condition score (BCS)) and transported to the ATARC laboratory for immediate processing.

Laboratory diagnosis

Standard laboratory parasitological techniques used in this study included: Simple test tube flotation, sedimentation technique, McMaster faecal egg count (Jorgen and Brian, 1994) and Inep techniques (modified Baermann technique) (Anne, 2006).

Data analysis

During the sample collection, the breed, age, sex and BCS of each animal was recorded and stored in a Microsoft Excel spreadsheet. Laboratory findings were added to the spreadsheet. The data were analyzed by STATA Microsoft (version 7.0). Descriptive statistics such as percentages and chi-square (x^2) tests were conducted. In all the analyses, confidence levels were held at 95% and p<0.05 was set for significance.

For mixed nematode burdens (on basis of faecal egg counts) the intensity of infection was ascribed as low (0 to 500 eggs/gram faeces), moderate (501 to 2000 eggs/gram) or heavy (>2001 eggs/g) (Mary et al., 2009). Significant *Strongyloides* spp. burdens are in the range 2001 to 10,000 eggs/g and <2000 are considered non-significant. The faecal egg counts of *Moniezia* spp. and *Skrjabinema* spp. are variable (Love and Hutchinson, 2003).

RESULTS

Overall prevalence

Parasitological analytical data indicated that all goats examined harbored either single or mixed infections. Strongyle–type, *Skrjabinema* species and *Moniezia* species eggs were counted. Oocysts of *Eimeria* species were also present in some animals.

DISCUSSION

The study was undertaken to estimate the prevalence of internal parasites infecting Boer goats at the Adami Tulu Agricultural Research Center and to determine the types of internal parasites present, their intensity and their associated risk factors. Accordingly, the study demonstrated the prevalence of the internal parasites infecting goats at ATARC was 100%. The parasites identified using coprologic parasitological procedures were *Strongyloides* spp. (4.7%), *Moniezia* spp. (7.8%), *Skrjabinema* spp. (11.5%), strongyle-type (49.5%) and *Eimeria* spp. (100%) (Table 1). Cases of single and multiple infections were observed, although most of the samples were found with multiple infections. The dominance of *Eimeria* spp. and strongyle-type parasites was similar to other studies (Suttiyotin, 1987; Kochapakdee et al., 1997; Regassa et al., 2004) but differed from the results of Abebe and Esayas (2001), who indicated prevalence's of 100% for strongyle-types and 52.5% for *Eimeria* oocysts. The prevalence's in the present study may be due to the geographic location of ATARC, and are consistent with reports from sub-Saharan countries where prevalence and faecal egg counts are higher in lowland and mid-altitude areas (Teklye, 1991; Regassa et al., 2004) (Table 2).

It would be more appropriate to reiterate that the flock is not 'closed' because of the interaction with local goats that breach the fencing and that there may be an unknown influence on the parasite burdens as a consequence. There are several drivers behind this: The stocking rates on each part of the goat farm and the number of unwanted visiting goats.

The overall incidence of parasite infection within the study area may be attributed to lower immunity of the goats (e.g. compared to many sheep breeds (Table 3).). There is evidence that the control of coccidiosis is essential for the health of goats raised under intensive management system (Milton et al., 1987).

There were statistically significant differences ($p < 0.05$) in parasite prevalence and the presence of more than one type of parasite in the studied goats. *Eimeria* species were not affected by risk factors such breed, age, and sex and BCS ($p > 0.05$) (Table 4). These results contradict other studies where significantly higher prevalence rates were recorded in kids than in adult animals (Dunn, 1978; Shah-Fischer and Say, 1989; Nwosu, 1996; Regassa et al., 2004; Githigia, 2005). But Rajapakseb, (2001) reported that some *Eimeria species* were common in all age categories (*Eimeria ninakohlyakimovae*, *Eimeria alijevi* and *Eimeria arloingi*). Regassa et al. (2006) reported that sex and BCS of goats did not show a significant association with the prevalence and level of faecal egg count, which is consistent with the present study.

The second dominant parasite species were strongyle-types with a prevalence rate of 49.5%. While this prevalence is relatively high, it is lower when compared to other studies such as Abebe and Esayas (2001), where prevalence was 100%. Animal breed and sex showed a significant association with prevalence of strongyle-type parasites ($p<0.05$) (Table 5). The crossbred goats had a significantly higher frequency of infection with strongyle-type parasites than the pure Boer goats. This could be due to several factors, e.g. the management system where the cross-bred goats are housed with Arsi-Bale goats, which cross fences and mix with other local goats. Animal sex showed a significant association with the prevalence of the strongyle-type parasites, which differed from other papers (Regassa et al., 2004; Keyyu et al., 2003).

Skrjabinema spp., *Moniezia* spp. and *Strongyloides* spp. were found in 11.5, 7.8 and 4.7% of goats, respectively. Since these parasites are usually non-pathogenic in ruminants (Troncy, 1989; Radostits et al., 2007), these frequencies of infection are not likely to be serious threat to animal health but their accumulated effects may be detrimental if in multiple infections.

CONCLUSION AND RECOMMENDATIONS

This study objectively assessed and identified that eggs and oocysts of strongyle-type, *Strongyloides, Skrjabinema, Moniezia* and *Eimeria* were prevalent in goats on this goat farm; all goats were infected with a least one type of parasite. This high prevalence of infection indicates the potential for parasites to hamper the productivity and health of animals grazing at the farm. The integrity of the breeding program was affected by locally bred goats crossing the boundary fences and non-planned mating occurring. This may contribute to disease transmission including helminth parasites. The statistical analysis revealed that there was significant variation in goat breed, age and sex. Most goats were infected with two or more types of parasite with fewer animals showing single infection. The results indicate that internal parasites are likely to be one of the major problems that influence the efficient utilisation of production potential of the goats. This requires attention focused on minimizing the problem by designing effective control measures.

The following recommendations were proposed:

1. Strategic deworming is important to break the life cycle of parasites. Control measures for internal parasites designed to reduce the intensity of parasitic infection, especially in the wet season when temperatures and humidity are favourable for development and survival of

Table 1. Prevalence of each type of parasite egg or oocyst counted from 192 samples.

Parasite	Number of positive	Prevalence (%)
Strongyloides spp	9	4.7
Moniezia spp.	15	7.8
Skrjabinema spp.	22	11.5
Strongyle-type	95	49.5
Mixed infections	110	57.3
Eimeria spp.	192	100

Mixed infection: *Strongyle*, *Moniezia* and *Eimeria* together.

Table 2. Infection status (faecal egg counts) and relationship to breed, age, sex and BCS.

Variable categories	—	*Eimeria* spp.	Strongyle-type	*Strongyloides* spp.	Mixed infection		
					Light	Moderate	Heavy
Breed	Pure	104	34	7	0	6	46
	Cross	88	52	2	0	5	52
Age	Young	129	52	3	0	6	63
	Adult	63	34	6	0	5	35
Sex	Male	79	44	3	0	6	43
	Female	113	52	6	0	5	55
BCS	Good	157	75	8	0	11	82
	Thin	35	11	1	0	0	16

Young = Less than one year age.

Table 3. Maximum, minimum and mean of identified parasites.

Parasite identified	Minimum	Maximum	Mean
Strongyle-type	0	1100	1554
Strongyloides spp.	0	200	5.7
Skrjabinema spp.	0	1400	26.0
Eimeria spp.	100	174,600	10,547
Moniezia spp.	0	2500	43.2
Mixed infection	0	174,700	4677

Table 4. Prevalence of identified internal parasites with risk factors (%).

Parasite identified	Breed (%)			Age (%)			Sex (%)			BCS (%)		
	Pure	Cross	Total	Young	Adult	Total	Female	Male	Total	Good	Thin	Total
Strongyle-type	41.3	59.0	49	47.2	53.9	49.4	43.5	58.6	49.4	52.5	35	49.4
Strongyloides spp.	6.7	2.2	4.6	2.3	9.5	4.6	5.1	4.0	4.6	5.0	2.9	4.6
Skrjabinema spp.	14.4	7.9	11.	9.3	15.8	11.4	9.4	14.6	11.4	10.1	17	11.4
Moniezia spp.	7.6	7.9	7.8	5.4	12.7	15	10.2	4.0	7.8	8.2	5.8	7.8
Eimeria spp.	100	100	100	100	100	100	100	100	100	100	100	100
Mixed infection	50.96	64.77	57	54.26	63.5	57.3	51.28	66.6	57.3	59.5	47	57
Over all	100	100	100	100	100	100	100	100	100	100	100	100

Table 5. The association of identified internal parasites with breed, age, sex and body condition score.

Parasite identified	Breed		Age		Sex		BCS	
	X^2	P-Value	X^2	P-Value	X^2	P-Value	X^2	P-Value
Strongyle-type	6.0043	0.014	0.7559	0.385	4.1560	0.041	3.326	0.068
Strongyloides spp.	2.1204	0.145	4.9090	0.027	0.1302	0.718	0.282	0.595
Skrjabinema spp.	1.9659	0.161	1.8013	0.180	1.2487	0.264	1.560	0.212
Moniezia spp.	0.0046	0.946	3.1080	0.078	2.4839	0.115	0.214	0.644
Eimeria spp.	-	-	-	-	-	-	-	-
Mixed infection	3.716	0.054	1.4733	0.225	4.4209	0.036	1.768	0.184

pre-parasitic stages, is important. The timing of anthelmintic treatments needs to be investigated further to help minimize the risk for the development of drug resistance.

2. Further identification of the internal parasites (particularly strongyle-types) must be conducted to confirm the susceptibility of the Boer goats to particular parasite species before distributing the cross-bred goats.

3. Appropriate fencing is important to reduce unwanted offspring and to prevent additional disease transmission including helminths parasites.

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REFERENCES

Abebe W, Esayas G (2001). Survey of ovine and caprine gastro-intestinal helminthosis in eastern part of Ethiopia during the dry season of the year. Revue Med. Vet., 152(5): 379-384

Anne MZ, Gray AC (2006). Veterinary Clinical Parasitology. 7th ed. Australia, Blackwell Publishing, pp. 11-14.

Cameron MR, Luo J, Sahlu T, Hart SP, Coleman SW, Goetsch AL (2001). Growth and slaughter traits of Boer x Spanish, Boer x Angora, and Spanish goats consuming a concentrate-based diet. J. Anim. Sci., 79: 1423-1430.

Dai Y, Liu X, Liu M, Tao J (2006). Pathogenic effects of the coccidium Eimeria ninakohlyakimovae in goats. Vet. Res. Commun., 30: 149-160.

Devendra C, Meclorey G (1990). Goat and Sheep Production in the tropics Singapore, Longmant. pp. 1-5.

Dunn AM (1978). Veterinary helminthology. 2nd edition. London: William Heinemann Medical Books

Ebro A, Eticha G, Hussen A (1998). Thirty years of research experience of Adami Tulu Agricultural Research Centers: Agricultural Research condition service of Oromia Agricultural Development Bureau. Bulletin number, 1: 1-46.

Erasmus JA (2000). Adaptation to various environments and resistance to disease of the improved Boer goat. Small Rumin. Res., 36: 179-187.

Getenby RM (1991). Sheep: The tropical agriculturalist. London and Basingstoke, MacMillan Education Ltd, Acct. pp. 6-10.

Githigia SM, Thamsborg SM, Maingi N, Munyua WK (2005). the epidemiology of gastrointestinal nematodes in goats in low potential areas of Thika District, Kenya. Bull Anim. Health Prod. Afr., 35(1): 5-12.

Ibrahim H (1998). Small ruminant production techniques. ILRAD, Manual No.3, ILRI, Nairobi, Kenya. pp. 1-36.

ILCA (International Livestock Center for Africa) (1990): Annual report, 1989. Addis Ababa, Ethiopia

Keyyu JD, Kassuku AA, Kyvsgaard NC, Willingham AL (2003). Gastrointestinal nematodes in indigenous zebu cattle under pastoral and nomadic management systems in the lower plains of southern highlands of Tanzania. Vet. Res. Commun., 27(5): 371-380.

Jorgen H, Brian P (1994). The epidemiology, diagnosis and control of helminth parasites of ruminants. Kenya, A handbook, ILRAD.

Love SCJ, Hutchinson GW (2003). Pathology and diagnosis of internal parasites in ruminants. In: Gross pathology of ruminants, Proceeding 350. Post-graduate foundation in veterinary science, University of Sydney, Sydney; 16: 309-338.

Malan SW (2000). The improved Boer goat. Small Rumin, Res., 36: 165-170.

Mary CS, David MS (2009). Digestive system. In: Goat medicine. 2nd edition. pp. 377-450.

Milton JTB, Kochapakdee S, Saithanoo S, Pralomkarn W, Rakswong W, Suttiyotin P (1987). Features of the goat research facility at Prince of Songkla University. In Proceedings of the 25th annual conference on animal science, Kasetsart University, Bangkok, Thailand. pp. 14 - 21.

Nwosu CO, Ogunrinade AF, Fagbemi BO (1996). Prevalence and seasonal changes in the gastrointestinal helminthes of Nigerian goats. J. Helminthol., 70: 329-333.

Radostits OM, Gay CC, Hinchliff KW, Constable (2007). Disease associated with helminth parasites. In: A text book of the diseases of cattle, horse, sheep, pig and goats.10th ed, p.1562.

Rajapakseb RPVJ (2001). Prevalence of gastro intestinal nematodes infections in cross breed goats in dry areas of Sri Lanka. J. Vet. Anim. Sci., 1: 14-17.

Regassa F, Sori T, Dhuguma R, Kiros Y (2006). Epidemiology of Gastrointestinal Parasites of Ruminants in Western Oromia, Ethiopia. Intern J. Appl. Res. Vet. Med., 4(1): 57-64.

Shah-Fischer M, Say R (1989). Manual of Tropical Veterinary Parasitology. CAB International; the Technical Center for Agricultural and Rural Cooperation (CTA).

Suttiyotin P (1987). A survey of internal parasites of native goats in Songkla. Songklanakarin J. Sci. Technol., 9: 7-18.

Teklye B (1991). Epidemiology of endoparasites of small ruminants in sub-Saharan Africa. In Proceedings of 4th national livestock improvement conference. Addis Ababa, Ethiopia; pp.13-15.

Troncy PM (1989). Coccidiosis of ruminants. In: Manual of Tropical Veterinary parasitology. pp. 58-59.

Waller PJ (2004). Management and control of nematode parasites of small ruminants in the face of total anthelmintic failure. Tropical Biomed. 21: 7-13.