

# Determination of anthelmintic resistance in goats and sheep using faecal egg count reduction test at Luguruni farm, Dar es Salaam, Tanzania

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## SUMMARY

Nematode parasites are known to pose a challenge to small ruminant production in Tanzania due to their fast development of resistance to the commonly used anthelmintics. The objective of this study was to determine the resistance of anthelmintics in small ruminants. A total of 30 sheep and 30 goats aged between 6 and 12 months at Luguruni farm, Dar es Salaam with egg per gram (EPG) of 150 or above were tested for anthelmintic resistance by using faecal egg count reduction test. Three groups of 10 animals each were treated with recommended dose of albendazole, levamisole and placebo and were followed up for faecal egg reduction. A Modified McMaster Counting Chamber was used to determine the EPG where as Hematocrit reader for PCV reading. It was found that the percentage reduction of eggs in goats treated with albendazole and levamisole were 80% and 88.2%, respectively, and the 95% Lower confidence limit of 53.4 and 60, respectively. In sheep the percentage reduction of eggs were 60% and 73.1% respectively, the 95% lower confidence limit were 0 and 38, respectively. With these results, the nematodes showed resistance to anthelmintics used because the percentage reduction in egg count was less than 95% and the lower limit of the 95% confidence interval less than 90%. The PCV as recorded in Sheep and Goats before and after treatment with anthelmintics drugs shows slight changes in terms of their values so this is convincing that there was less burden of *Haemonchus corntotus*

**Keywords:** Albendazole, levamisole, McMaster, PCV, resistance.

## INTRODUCTION

Goats and sheep are important domestic small ruminants as source of meat, milk, money and many other supports to the urban and rural poor in Tanzania. The goats and sheep population in Tanzania are 17.1 and 9.2 millions respectively (URT, 2016). The goats and sheep in Tanzania are mostly kept under traditional production system where they extensively graze during the day time and are locked in animal house at night. The animals under such kind of management system rarely get veterinary services. Although goat and sheep are important sources of livelihood of many rural and urban people, it is constrained by many factors such high level of stress, poor husbandry practices, poor animal genetic potential, poor nutrition, inadequate health and veterinary support services and diseases (URT, 2006). Among the important diseases of goats and sheep are those caused by helminthes (Kusiluka and Kambarage, 1996).

Gastro-intestinal nematode parasitic infection is one of the important helminth problems of goats and sheep (Kusiluka and Kambarage, 1996). Gillian *et al.* (2004) reported that nematode infections affect the health of millions of people and animals, causing huge economic loss in livestock farming. Previously, Mulugeta *et al.* (1989) reported that the infection is enormous in small ruminants that cause

major production loss. Nematode infection is rampant in most developing countries where poor pastures and the quantities of nutritious food consumed do not cover the nutritional requirements of animals (Leng, 1991). The consequences of nematode infection include: reduced feed intake and weight gain, reduced immunity, lower fertility, a reduction in milk production and work capacity, treatment expenses and death in critical infections (Fikru *et al.*, 2006; Hale, 2006).

A study by Kassuku *et al.* (1997) in Morogoro determined the efficacy of albendazole after it had been withdrawn from use due to the development of resistance. The study also tested for efficacy of levamisole, which had been recommended to replace albendazole. It was found that the gastro-intestinal nematodes were resistant to albendazole and levamisole. The possible causes of resistance may be indiscriminate uses of the anthelmintics, counterfeit drugs and sometimes uses of same products for a long time. Ever since the study by Kassuku and others to date, it is almost 20 years without having another similar study and the same anthelmintics are still on use.

Therefore there is need to determine the anthelmintic efficacy of commonly used anthelmintics in sheep and goats in Tanzania so as to advice accordingly the government and other

stakeholders on which drug should be used. The purpose of this study was to determine the anthelmintic resistance of albendazole and levamisole in goats and sheep based on fecal egg count reduction test at Luguruni Farm, Dar es Salaam Tanzania.

## MATERIALS AND METHODS

### Study area and animals

This study was conducted at Luguruni Farm, Kibamba which is in Dar es Salaam region. The study was conducted between December 2015 and July 2016. The study involved goats and sheep which were extensively grazed in natural pasture found in the Luguruni Farm. Helminth control is done routinely after every three months by using albendazole and levamisole.

### Set up of the experiment and anthelmintic administration

Faecal samples of goats and sheep was collected and the EPG was established by using standard procedures as described by Hansen and Perry (1990). The goats (n= 30) and sheep (n=30) with EPG of more than 150 and the age between 6 and 12 months were included in the anthelmintic trials. The distribution of the animals was: On day zero, 10 goats were treated with albendazole (7.5 mg/kg) orally, 10 were treated with levamisole (8 mg/kg) intramuscular and the other 10 goats were the control group which were given placebo (distilled water orally). In addition, blood samples were being collected from the jugular vein into EDTA vacutainer tubes for packed cell volume (PCV) determination. The same procedures were done for sheep of same number, medication and PCV analysis. The study animals were kept under the same management system and reexamined for fecal egg count reduction and PCV after 14 days post treatment.

### Assessment of fecal egg count reduction after 14 days

**Table 1.** Faecal egg count reduction in goats and sheep after 14 days administration of albendazole and levamisole

Animal species	Percentage faecal egg reduction		95% lower confidence limit	
	Albendazole	Levamisole	Albendazole	Levamisole
Goats	80	82.2	53.4	60
Sheep	60	72	0	38

After 14 days post intervention, faecal samples were corrected from rectum of each animal by using gloved hands and labeled accordingly. Similarly, blood samples were collected from the jugular vein into EDTA vacutainer tubes for packed cell volume (PCV) determination. All the samples were being stored in cool box packed with ice packs and subsequently transported to the Parasitology Laboratory at Tanzania Veterinary Laboratory Agency (TVLA) Dar es Salaam for analysis. The EPG again determined by using standard procedures as described by Hansen and Perry (1990). Determination of PCV was done as described by Egbe-Nwiyi (2000).

### Data analysis

The percentage reduction in faecal egg count and the 95% confidence intervals was calculated for each treatment group from the arithmetic means of the faecal egg counts. The percentage reduction was calculated as  $100 (1 - X_t/X_c)$  whereby 't' was the mean egg count of the treated group and 'c' was the mean egg count of the untreated group. Resistance to an anthelmintic group was considered to be present if the percentage reduction in egg count was less than 95% and the lower limit of the 95% confidence interval less.

## RESULTS

Results of faecal egg count reduction are shown in Table 1. It was found that the percentage reduction of eggs in goats treated with albendazole and levamisole were 80% and 88.2% respectively and the 95% Lower confidence limit of 53.4 and 60, respectively. In sheep the percentage reduction of eggs were 60% and 73.1% respectively, the 95% lower confidence limit were 0 and 38 respectively. Some of the helminths eggs that were observed under the microscope are shown on Figure 1.



**Figure 1.** Nematode egg (arrow) under microscope x10 magnification

### Packed cell volume results

The PCV of goats and sheep in the farm ranged between 24% and 37% which is within the normal range of 24% - 45%. This implies that the goats and sheep were not anaemic.

### DISCUSSION

Gastro-intestinal nematode parasites are currently becoming a challenge in small ruminant production. Synthetic anthelmintic drugs have been used for the control of nematodes in small ruminant. However, nematode parasites are progressively developing resistance to these anthelmintics. In addition, the high cost of the drugs, their possible residual effect on animal by-products and adverse effects of the parasites seem to be pushing small scale farmers out of the industry. The results of this study have shown that nematodes are resistant to albendazole and levamisole because the percentage reduction in egg count was less than 95% and the lower limit of the 95% confidence interval less than 90%. Therefore, alternative means of helminthosis treatment in goats and sheep have to be considered otherwise farmers will keep on incurring unnecessary costs to drugs which are not effective.

According to the results, it shows that the treatment of goats and sheep with 10% albendazole and 3.0% levamisole the percentage reduction were 80% and 88.2% respectively and the 95% confidence limit were 53.4 and 60, respectively. The percentage reduction of helminthes faecal count by albendazole and levamisole were 60% and 72%. These results correlate with study done by Kassuku *et al.* (1997) in Morogoro, Tanzania. The goats on the first farm had a 97% reduction in faecal egg count, with a 95% lower confidence limit of 81% and at the second farm, 10 days after treatment, sheep treated

with levamisole had a 99.4% reduction in faecal egg count, with a 95% lower confidence limit of 88.9%. For sheep the percentage reduction with 10% albendazole and 3.0% levamisole were 60% and 72% respectively, the 95% lower confidence limit were 0 and 38, respectively, this means that the nematodes parasites have developed resistance to both drugs. These results correlate with the sheep treated with levamisole on the first farm had a 98% reduction in faecal egg count, with a 95% confidence limit of 76%. Where the sheep treated with albendazole only had a 59.4% reduction in faecal egg count, with a 95% lower confidence limit of -19.6%.

Also in Southern Ethiopia research done in sheep and goats by (Sheferaw *et al.*, 2013) showed that the percentage reduction of faecal helminth eggs by albendazole and levamisole were 95.04% and 96.6% respectively, lower confidence limit of Sheep and Goats were 86.5% and 88.3%, respectively.

The PCV in the farm were in range of 24%-37% which is within the normal range of 24%-45% and implied that regardless of the EPG of more than 150 in animals aged between 6 and 12 months the animals were not anaemic. This may be because the blood sucking helminthes like *Haemonchus corntotus* were not many to the extent of causing reduction in blood volume.

It is concluded that nematodes of goats and sheep at Luguruni farm are resistant to albendazole and levamisole. Therefore, alternative antihelmintics with high efficacy is recommended. Routine checkup of the nematode parasite species at Luguruni farm by faecal culture is important which can also guide on the choice of antihelmintics to use in treatment. Further studies using bigger sample size is recommended before concluding with certainty on resistance shown by nematodes to albendazole and levamisole in this study.

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