Journal of Applied Veterinary Sciences, 10 (4): 37-42 (October, 2025).

ISSN: Online: 2090-3308, Print: 1687-4072

Journal homepage: https://javs.journals.ekb.eg



# Anthelmintic Efficacy of Garlic against Common Gastrointestinal Parasites in Sheep in Lesotho

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#### **ABSTRACT**

This study was conducted to evaluate the anthelmintic efficacy of garlic (Allium sativum) against common gastrointestinal parasites (GIPs) in lambs at the National University of Lesotho (NUL) farm. A total of 17 lambs were purposively selected and randomly allocated to four treatment groups, including three garlic dosage levels (5 ml, 10 ml, and 15 ml) and a control group treated with the commercial anthelmintic, Prodose Orange. SPSS version 20 was used for the analysis of the data, where the paired sample T-test was used to determine the reduction rate in faecal egg counts, while the Kruskal-Walli's test was used to determine the effectiveness between different levels. Two types of GIPs were identified, namely nematodes and coccidian, both with a 100% prevalence rate. In terms of faecal egg abundance, nematodes were significantly higher than coccidia. For efficacy determination, only nematodes were used. Garlic at the dosage rates of 10 ml and 15 ml yielded a statistically similar reduction rate to that of Prodose Orange 14 days after treatment. When determining the fecal egg reappearance period after 28 days, it was observed that garlic at a dosage rate of 10 ml demonstrated an insignificant increase similar to prodose orange, while a dosage rate of 15 ml demonstrated a significant increase, suggesting that it remains effective but for a short time. It is therefore concluded that garlic, particularly at the dosage rate of 10 ml, is effective for the control of GIPs and can be used interchangeably with Prodose Orange due to their similar performance.

Keywords: Effectiveness, Garlic, Gastrointestinal Parasites, Nematodes,

Original Article:

DOI: https://doi.org/10.21608/jav s.2025.405911.1681

Received: 20 July, 2025. Accepted: 11 September, 2025. Published in October, 2025.

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J. Appl. Vet. Sci., 10(4): 37-42.

#### INTRODUCTION

Prodose orange.

Lesotho is known as a mountainous country, which makes it ideal for sheep farming due to plenty of grazing areas. Sheep farming remains the major source of livelihood for Basotho, particularly those in remote areas of the country where there are limited means of living. Despite the unfolding significance of sheep production in the country, the industry is confronted with several setbacks, including, among others, the prevalence of gastrointestinal parasites. The infestation by various gastrointestinal parasites remains a major constraint worldwide among sheep producers. Singh et al., (2015) indicated that helminths represent the most important parasites that affect the growth as well as the production of farm animals (Zhong et al., 2015).

According to **Abdul-Rahman** *et al.*, (2023), the financial and agricultural losses due to internal parasites have a considerable impact on farm profitability. Similarly, Batool *et al.* (2022) articulated that infestation by internal parasites leads to reduced efficiency and productivity of animals and increased

mortality, directly affecting the income of farming communities. This is validated by **Sackett and Holmes** (2006) who opined that the annual cost associated with parasitic diseases in sheep and goats in Australia was estimated at 1 billion dollars.

Commercial anthelmintics have been used intensively among farming communities for the control of gastrointestinal parasites; however, the effectiveness of these drugs is increasingly being compromised by the development of resistance in parasite populations (Sales and Love, 2016; Mckenna, 2018). Abdul-Rahman et al., (2023) articulated that livestock producers have been using commercially available anthelmintics like benzimidazoles,imidazothiazoles-tetrahydro-pyrimidine and avermectins-milbemycins to control parasites. Besides the increasing concern of parasites developing resistance to commonly used drugs, this treatment method is also expensive for some farmers, as stated by Veale (2002). Most importantly, the availability and affordability of these commercial drugs among farming communities, particularly in remote areas, remains a

challenge (Kompi and Mojai, 2024). Given this condition, much research has been done to find alternative forms of anthelmintics (Shalaby, 2013). All these given facts provide convincing evidence that control programs based exclusively on anthelmintic use are not sustainable.

In recent years, there has been increasing interest in the use of medicinal plants as alternative treatments for gastrointestinal parasites in livestock. Herbal remedies from plant species have been confirmed to have some efficacy against gastrointestinal nematodes in sheep (Mutunga et al., 2021). Housseyn et al., (2025) also indicated that alternative treatment options, including the use of medicinal plants, are highly required. For centuries, people have used garlic as a common herbal remedy (Sunita et al., 2013). There are several previous studies that have confirmed the efficacy of garlic against common gastrointestinal parasites (Toulah and AlRawi, 2007; Worku et al., 2009; Massamha et al., 2010). The bioactive compound allicin, produced when garlic is crushed, has been shown to possess antiparasitic properties against a range of helminths (Anosike et al., 2017). In Lesotho, limited information is known about the use of garlic for medicinal purposes in livestock; hence, the current study was undertaken to determine its efficacy against common gastrointestinal parasites in lambs.

# **MATERIALS AND METHODS**

### **Study site description**

The study was conducted at the National University of Lesotho (NUL) farm, located in Roma, Maseru, Lesotho. Roma falls under the foothills of Maseru District, and it is a settlement under the Manonyane Community Council, 34 kilometers southwest of Maseru. According to Makoloi (2021), the foothills comprise the area between the lowlands and the highlands, which occupies about 4,600 km<sup>2</sup>, representing 15% of the total area of the country. This region lies between 1,800 m and 2,000 m above sea level and forms the total land area (Maro, 2011). Kuleile et al., (2019) described the Roma Valley as a broad valley surrounded by a barrier of rugged mountains, which provide magnificent scenery, with a temperate climate with four distinct seasons. Sheep in the NUL farm are exposed to grazing conditions (dense and moist vegetation, seasonal climate variations) that are favorable to gastrointestinal infections.

#### Study animals and sampling

The purposive sampling technique was used, where 17 lambs were selected from the farm. In terms of management, the lambs were maintained mainly on grazing as the source of nutrition. These lambs were naturally infected with gastrointestinal parasites however they were not showing any sign of illness.

# Study design

A longitudinal approach was used where complete randomized design was utilized. The study involved the use of garlic at three different concentrations (T1= 60g, T2= 40g, T3= 20g) and a control group (prodose orange). Five lambs were assigned for treatment 2 while all other treatments including the control had 4 lambs because with the number of available lambs, we could not have equal numbers for each treatment.

### **Drug** preparation and dosage

Fresh garlic bulbs were sourced from a reputable supplier. The protective leaves of garlic were removed to access the cloves, which were crushed. Crushed garlic was measured at three different levels, being 60 g, 40 g, and 20 g, and after that, all three levels were mixed with 500 ml of water to make a solution. The lambs were assigned randomly to different treatments, and the lambs in treatment 1 received 5 ml of a highly concentrated solution (60 g), while those in treatment 2 received 10 ml of a medium solution (40 g). and lastly, those in treatment 3 received 15 ml of a lowconcentration solution (20 g). These dosage levels align with a previous study by Abdul-Rahman et al., (2023) who used a 10 ml-20 ml solution of garlic. Prodose orange was administered orally at the recommended dosage of 2 ml per 10 kg body weight for the control group.

### **Fecal sample collection**

The faecal sample collection was done from January to March 2025. The faecal samples were taken directly from the rectum of the lambs using the disposable gloves. Disposable gloves were used for the collection of faecal samples, and one glove was used per animal. The first set of faecal samples was collected before drug administration (DAY 0) to determine the initial prevalence and load of gastrointestinal parasites. Immediately after the first set of faecal sample collection, the lambs were treated with the garlic and Prodose Orange based on the levels already indicated. The second set of faecal samples was collected again 14 days post-treatment to determine the reduction rate. The third set of faecal samples was also taken 14 days after the second set to determine the reappearance rate of faecal eggs.

# Faecal sample preparation

The samples were packed in a cooler box containing ice packs to eliminate incidences of eggs hatching. Upon arrival at the National University of Lesotho laboratory the samples were processed within 48 hours after collection. In the laboratory, the method used was a simple McMaster technique with a detection limit of 50 eggs per gram (EPG) as described by **Kyvsgaard** *et al.*, (2011). The flotation solution of

sodium chloride was prepared whereby 400g of sodium chloride (NaCl) was dissolved in one litre of distilled water. From each sample 4g were measured using the scale, and the sample was mixed with 56 millilitres (ml) of the flotation solution to make a slurry. The mixture was then blended.

After blending, the mixture was then sieved into the beaker, and four drops of amyl alcohol were added to the sieved mixture to treat bubbles, which can be mistakenly counted as parasite eggs. Using the disposable pipettes few millilitres were drawn from the sample, and the two chambers of the McMaster slides were filled. Eggs were examined microscopically (10× and 40×). The parasitic eggs were identified based on the morphology (Adeppa et al., 2014). The laboratory cell counter was used to count floating eggs, and each number was multiplied by a factor of 50 to give an approximate number of eggs/gram of faeces.

# Data analysis

The data was captured in Excel and was transferred into Statistical Package for Social Sciences (SPSS) version 20.00 for analysis. The descriptive statistics were used to determine the prevalence of GIPs. Paired-sample T test was used to determine the reduction in faecal egg load at different treatments. Krukal-whillis test was used to determine the effectiveness between different levels. In all analysis, significance was tested at 0.05 and the results were presented in tables.

### RESULTS

# Prevalence of different gastrointestinal parasites

The results presented in **Table 1** summarize the prevalence of different gastrointestinal parasites in lambs. The results confirmed the prevalence of two families of gastrointestinal parasites, namely nematodes and coccidian, with similar prevalence rate of 100%. This makes the overall prevalence rate of 100% of GIP for the study.

**Table 1:** The prevalence of different gastrointestinal parasites.

Type of GIP	No. of samples	Prevalence
		(%)
Nematodes	17	100
Coccidian	17	100

GIP= Gastrointestinal parasites

### Faecal egg load of different GIPs

The results presented in **Table 2** summarize the faecal egg load of different gastrointestinal parasites obtained. The table depicts that 17 animals were examined and the results confirmed a statistically

significant (p= 0.02) difference in the faecal egg load between nematodes and coccidian in the lambs, where more infestation was observed on nematodes.

Table 2: The faecal egg load of different GIPs.

Type of	No. of	Means	Sig.V	SE
GIP	samples			
Nematodes	17	4681.58		801.162
			0.02	
Coccidia	17	1344.74		312.341

Sig.V= significance value, S.E = standard error

# Nematode pre- and post-treatment fecal egg count means

Table 3 compares the reduction rate in faecal egg counts under different treatment levels between day 0 and day 14 (before treatment and after treatment). It was observed that all treatments yielded a significant reduction in faecal egg loads as demonstrated by different superscripts in the same row for FEC in day 0 and FEC in day 14. With regard to the reduction rate, it was observed that 10 ml, 15ml and control yielded a significantly similar reduction rate and the three were significantly higher than 5ml as demonstrated by different superscripts in the column of reduction percentages.

**Table 3:** Nematode pre-and post-treatment fecal egg count means (day 0 and day 14).

Tratment	No. of	FEC-D0	FEC-D14	Reduction
	samples			%
5ML	4	5212.50a	2600.00 <sup>b</sup>	50.12a
10ML	5	$4080.00^{\rm a}$	$370.00^{b}$	$90.93^{b}$
15ML	4	5462.50 <sup>a</sup>	512.50 <sup>b</sup>	$90.60^{b}$
Control	4	2287.50a	337.50 <sup>b</sup>	85.26 <sup>b</sup>

<sup>ab</sup> Means within the same raw (FEC) with different superscripts differ significantly.

# Nematode fecal egg count means at days 14 and 28 post-treatment (re-appearance)

Table 4 compares the faecal egg reappearance rate between different treatments between days 14 and 28. The results showed that for 5 ml and 15 ml, there was a significant increase in the faecal eggs between the two points, while for 10ml and control, there was an increase, but not significant, as indicated by different superscripts on the same row.

**Table 4:** Nematodes faecal egg count between day 14 and day 28.

Tratment	No. of	FEC-D14	FEC-D28	Increase
	samples			%
5ML	4	2600.00a	3500.00 <sup>a</sup>	34.62
10ML	5	$370.00^{a}$	$390.00^{b}$	5.41
15ML	4	512.50a	1587.50a	209.75
Control	4	337.50a	$362.50^{b}$	7.26

<sup>ab</sup>Means within the same row with different superscripts differ significantly.

### **DISCUSSION**

The current results, which revealed a 100% prevalence rate of GIPs, are in close proximity with the findings of Shwe et al., (2020) who also reported a 99.3% prevalence rate. Similarly, Kelemework et al., (2016) reported a 91.4% prevalence rate, which is closer to the current findings. This high rate of GIP prevalence obtained in the current study and other studies is validated by Chai et al., (2023) who declared that sheep raised on ground-level pastures face higher parasite infection risks due to direct contact with soil, where infective larvae accumulate. The current results are, however, far above the report of Desalegn and Berhanu (2023) in the Toke Kutaye District of Ethiopia, who reported an overall prevalence of GIP infestation of 73.96%. This disparity might partly be explained by differences in the management of animals in different regions and countries. Most importantly, the difference might as well be due to a difference in the age of the animals examined, given that for the current study, only lambs were investigated for GIP infestation.

There were two types of gastrointestinal parasites recorded in this study: nematodes and coccidian. When comparing the prevalence rate between nematodes and coccidia, the current results revealed an equal rate of 100% for both parasites. This trend obtained in the current study differs from other reports, including that of Mahlehla et al., (2021) who reported a higher nematode (53.4%) rate than coccidian (46.5%) in the Maseru district of Lesotho. Another different trend was reported by Moses et al., (2016) who obtained 94.5% of nematode and 51.8% of coccidian. In the same way, Yan et al., (2021) reported 96.96% of nematode and 90.89% of coccidian. This disparity between the current study and other studies might partly be due to variations in the management of animals in different regions and countries. Moreover, the difference might be due to an age difference, as in the current study, only the lambs were investigated for the parasites.

The results of the current study, which revealed significantly higher fecal egg load for nematode than coccidian, align with the previous report of **Yan** et al.,

(2021) who observed higher nematode fecal egg load than coccidian. A similar trend has also been reported by Moses et al., (2016) who also reported higher fecal egg load for nematode than coccidian. The study conducted by Mahlehla et al., (2021) in Lesotho also confirmed higher nematode infestation than coccidian. The high nematode egg load observed in the current study may be explained by the age of the animals examined. Lambs, with no acquired immunity, are more susceptible to heavy nematode infections and tend to shed more eggs than adult sheep, which develop partial immunity over time. This is supported by findings from Desalegn and Berhanu (2023) who reported that young sheep in the Toke Kutaye District of Ethiopia had significantly higher nematode egg counts compared to adults, emphasizing the vulnerability of lambs to gastrointestinal nematodes.

The current results revealed that 10 ml and 15 ml yielded a similar reduction rate to the control group, and these results are comparable with those of Blessing et al., (2010) who observed no difference in the performance of garlic and the conventional drug, indicating that garlic is as effective as the conventional drug (prodose orange). Similarly, Abdul-Rahman et al., (2023) reported that garlic extract at 10 ml doses was effective in reducing fecal egg counts (FECs) of strongyles spp. Moreover, Equale et al., (2021) reported substantial reductions in gastrointestinal parasite burdens with the use of plant-derived treatments, provided that optimal dosages were used. Moreover, the 85.26% reduction observed in the control group aligns with findings by Molefe et al., (2020) who reported that commercial drugs like Prodose Orange still perform adequately on many farms in Southern Africa, though variability in efficacy is emerging due to developing resistance.

The results presented in Table 4 indicate that garlic can provide short-term protection against nematodes, particularly at the dose rate of 15ml as a significant increase in FEC was observed from day 14 to day 28. These outcomes align with **Kaplan (2010).** who argued that even natural anthelmintics could induce temporary suppression without full clearance, especially if some parasites survive treatment and resume reproduction as the anthelmintic effect gradually weakens.

Interestingly, the 10ml dosage rate appeared to perform similarly with the control group, as it was observed that between day 14 and day 28, there was an increase in FEC, however, not significant. This, in simpler terms, indicates that a 10ml dosage rate can remain effective for the control of gastrointestinal parasites for a month. A comparable study by **Tadesse** *et al.*, (2017) in Ethiopia found that garlic extract

maintained suppressed FECs for up to 30 days posttreatment in goats, underscoring its potential for longterm efficacy when dosed properly.

# **CONCLUSIONS**

It is concluded that lambs in the NUL farm are highly infested with gastrointestinal parasites. Nematodes represent the common GIP in terms of load. Garlic is effective for the control of GIPs in lambs at the concentration of 40 g at the dosage rate of 10 ml per lamb, as it can protect the lambs against gastrointestinal parasites for at least a month. This therefore indicates that garlic can be used interchangeably with Prodose Orange, as they performed similarly.

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#### How to cite this article:

Paseka Pascalis Kompi and Seeng Camilla Khomojoo, 2025. Anthelmintic Efficacy of Garlic against Common Gastrointestinal Parasites in Sheep in Lesotho. Journal of Applied Veterinary Sciences, 10 (4): 37-42. https://doi.org/10.21608/javs.2025.405911.1681