



# **Efficacy of Commonly Used Anthelmintics Against Naturally Occurring Gastrointestinal Nematodes in Goats**

**Binita Mitra <sup>a</sup>, Partha Sarathi Jana <sup>a</sup>, Shyam Sundar Kesh <sup>b</sup>,  
Soumitra Pandit <sup>c</sup> and Ruma Jas <sup>c\*</sup>**

<sup>a</sup> Department of Veterinary Medicine, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences, 37 Kshudiram Bose Sarani, Kolkata – 700 037, West Bengal, India.

<sup>b</sup> Department of Veterinary Clinical Complex, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences, 37 Kshudiram Bose Sarani, Kolkata – 700 037, West Bengal, India.

<sup>c</sup> Department of Veterinary Parasitology, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences, 37 Kshudiram Bose Sarani, Kolkata – 700 037, West Bengal, India.

## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author BM designed the methodology, data curation and investigation. Author RJ conceptualized the study and wrote the original draft. Author PSJ helped in project administration. Author SSK did the data analysis and methodology. Author SP wrote the protocol and did the formal analysis. All authors approved the final version of this manuscript.*

## **Article Information**

DOI: <https://doi.org/10.56557/ajmab/2024/v9i28820>

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://prh.ikpress.org/review-history/12312>

**Original Research Article**

**Received: 05/06/2024**

**Accepted: 08/08/2024**

**Published: 13/08/2024**

\*Corresponding author: E-mail: [rumajas@gmail.com](mailto:rumajas@gmail.com);

**Cite as:** Mitra, Binita, Partha Sarathi Jana, Shyam Sundar Kesh, Soumitra Pandit, and Ruma Jas. 2024. "Efficacy of Commonly Used Anthelmintics Against Naturally Occurring Gastrointestinal Nematodes in Goats". *Asian Journal of Microbiology and Biotechnology* 9 (2):70-74. <https://doi.org/10.56557/ajmab/2024/v9i28820>.

## ABSTRACT

Efficacy of four commonly used anthelmintics have been evaluated against naturally occurring gastrointestinal nematodes in goats following the method of faecal egg count reduction test (FECRT) in the present study. Fifty goats in the age group of 1 to 2 years old and of either sex, having infection with strongyle group of nematodes were selected in the sheep and goat farm under project 'Biotech Kisan Hub', West Bengal University of Animal and Fishery sciences and the goats were equally divided into five groups; group I (infected control), group II (albendazole treated), group III (fenbendazole treated), group IV (ivermectin treated) and group V (levamisole treated). Faecal egg count (FEC) in terms of eggs per gram of faeces (EPG) were estimated in all the experimental goats (n = 50) on 0-day post treatment (0 DPT) and again on 10 DPT. Efficacy of albendazole, fenbendazole, ivermectin and levamisole were 78.15%, 80.24%, 86.38% and 95.46%, respectively. Comparatively less efficacy of albendazole and fenbendazole indicated the emergence of anthelmintic resistance and lower efficacy of ivermectin might be due selection of resistant worms. Efficacy of levamisole was comparatively higher and it can be used strategically to control GI helminth parasites of goats in that farm.

**Keywords:** *Gastrointestinal nematodes; goat; efficacy; albendazole; fenbendazole; ivermectin; levamisole.*

## 1. INTRODUCTION

Gastrointestinal (GI) parasitic infection is the most common cause of economic losses in small ruminants all over the world [1,2] including India [3-5]. Rearing of goats followed by the Indian farmers make them highly susceptible to GI parasitic infections particularly nematode parasites. In most cases, GI nematodes occur as chronic and sub clinical infection and remain unnoticed and thereby causing significant financial losses to the farmers due to reduced appetite, decreased weight gain, milk production and reduction in body weight and sometimes death [4,6]. Among the different types of GI parasites, nematodes are most common such as *Haemonchus*, *Trichostrongylus*, Hookworm, *Oesophagostomum*, *Strongyloides* etc. [7,8] and immature paramphistomosis is also common in young animals. Control of GI helminth infection has primarily been dependent on the use of anthelmintics. But the indiscriminate use of anthelmintics has resulted into emergence of anthelmintic resistance in GI helminths [9-11]. Consequently, the increasing prevalence and severity of anthelmintic resistance due to increase in number of resistant worms [12-14] arising out of selection pressure by anthelmintics has jeopardised the pharmaceutical industry. The need of the hour is to use the anthelmintics strategically to maintain its efficacy, and also to monitor the efficacy of commonly used anthelmintics at a regular interval.

The present study was designed evaluate the efficacy of commonly used designed to evaluate

anthelmintics (albendazole, fenbendazole, ivermectin and levamisole) against naturally occurring GI nematode infection in goat.

## 2. MATERIALS AND METHODS

At first 70 goats in the age group of 1 to 2 years and of either sex in the sheep and goat farm under the project 'Biotech Kisan Hub', West Bengal University of Animal and Fishery sciences were coprologically screened for the presence of GI nematode infection by standard sedimentation and floatation technique [15]. Intensity of GI nematode infection was measured by the modified McMaster technique [15]. Finally, 50 goats having faecal egg count (FEC) more than 300 in terms of eggs per gram of faeces (EPG) were selected for evaluation of anthelmintic efficacy of albendazole, fenbendazole, ivermectin and levamisole.

Fifty goats were divided into five equal groups; Gr. I was kept as infected control (n = 10) and the goats of Gr. II, Gr. III, Gr. IV and Gr. V were treated with albendazole, fenbendazole, ivermectin and levamisole groups, respectively.

Efficacy of above mentioned anthelmintics were measured by faecal egg count reduction test (FECRT) following the recommendation of Coles et al. [16]. Quantitative faecal examination of all the goats were measured by the modified McMaster technique [15] on the day of giving treatment (0-day post treatment) and FEC in terms of EPG was against measured on 10 days post treatment (10 DPT).

Goats of Gr. II and Gr. III were treated with single oral dose of albendazole (Minthal<sup>®</sup>, Alembic) and fenbendazole (Panacur<sup>®</sup>, Intervet) @ 10mg / kg. body weight, Gr. IV was injected with ivermectin (Mectin<sup>®</sup>, Alembic) @ 0.2mg / kg body weight through sub-cutaneous route and the goats of Gr. V were orally dosed with levamisole (Lemasol-75<sup>®</sup>, Zenex AH) @ 2.5mg / kg body weight.

Efficacy of anthelmintics was calculated as per the following formula:

$$\% \text{ Efficacy} = (\text{Mean EPG in control group} - \text{Mean EPG in treated group}) / \text{Mean EPG in control group} \times 100\%$$

### 3. RESULTS AND DISCUSSION

Faecal egg count reduction test was performed to measure the efficacy of albendazole, fenbendazole, ivermectin and levamisole against the naturally occurring GI nematodes in goats.

Faecal egg count in terms of mean EPG in goats of Gr. I, Gr. II, Gr. III, Gr. IV and Gr. V were 407, 405, 415, 404 and 397, respectively on 0 DPT. Mean EPG of goats of Gr. I, Gr. II, Gr. III, Gr. IV and Gr. V were 412, 90, 82, 55 and 18, respectively on 10 DPT. According to the above stated formula the efficacy of albendazole, fenbendazole, ivermectin and levamisole were 78.15%, 80.24%, 86.38% and 95.46%, respectively.

In the present study, the efficacy of albendazole, fenbendazole and ivermectin was very less and it indicates resistance against those anthelmintics has been started to emerge in GI nematode population of the grazing field of goats under the project 'Biotech Kisan Hub', WBUAFS. Whereas, the efficacy of levamisole was little higher than the other anthelmintics but its efficacy also started to reduce. The goats of the farm were treated with anthelmintics, particularly albendazole and oxcyclozanide at three months interval and sometimes ivermectin was also used to treat ectoparasitic infection. Therefore, it could be assumed that GI nematode population of the present study area has developed resistance to albendazole and resistance to fenbendazole due same chemical group like that of albendazole [17]. Resistance to albendazole and fenbendazole has been recorded in GI nematodes of livestock in the world including India [10,18]. Low efficacy of albendazole has been reported by Brahma et al. [19] in GI nematode population of sheep and goat in West

Bengal. Benzimidazole group of anthelmintics particularly albendazole, fenbendazole etc. are very commonly used anthelmintics to treat GI helminth parasites in rural India including West Bengal. Therefore, resistance to those anthelmintics would create serious problem for the livestock owner. Although ivermectin has not been used frequently in the selected goats under study it has showed less efficacy (86.38%) which might be due to introduction of resistant worm population in the farm through the purchase of goats from different places of West Bengal. Resistance to ivermectin has been reported earlier [20]. In the present study levamisole showed 95.46% efficacy as it was never used before in the farm. The efficacy of levamisole as recorded in the present study was not up to the desired efficacy of 99 – 100%. The less efficacy of levamisole without using it before, might be either due to introduction of resistant worm population in the farm or due to contamination of grazing field with larvae of resistant worm population.

### 4. CONCLUSION

In the present study three commonly used anthelmintics (albendazole, fenbendazole and ivermectin) have been found to have very low efficacy against the GI nematodes and this is a matter of great concern as there is every possibility of development of anthelmintic resistance causing the drugs less effective against helminth parasites and it will make the helminth control programme difficult for the near future.

After the end of the study, the farm personnel were advised to use anthelmintic drugs judiciously keeping always refugia (population of untreated worms) and advised to change anthelmintic type.

### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

### ACKNOWLEDGEMENTS

The authors thankfully acknowledge the kind cooperation of Dr. K. C. Dhara, the Principal Investigator, Project on 'Establishment of Biotech Kisan-Hub' funded by the Government of India

for giving permission to conduct the anthelmintic trial on goats of the farm under the project.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Perry BD, Randolph TF, McDermott JJ, Sones KR, Thornton PK. Investing in Animal Health Research to Alleviate Poverty. International Livestock Research Institute (ILRI), Nairobi, Kenya. 2002;148.
2. Mhoma RL, Kanyari PWN, Kagira JM. The prevalence of gastro-intestinal parasites in goats in urban and peri-urban areas of Mwanza City, Tanzania. *Scientia Parasitologica*. 2011;12(4): 203-208
3. Jas R, Datta S, Ghosh JD. Economic impact of gastrointestinal nematodosis in goat on meat production. *Journal of Veterinary Parasitology*. 2007;21(2):109-112.
4. Jas R, Ghosh JD. Economic impact of gastrointestinal nematodosis in sheep: enhanced meat production by anthelmintic treatment. *Indian Journal of Animal Sciences*. 2009;79(8):761-763.
5. Singh AK, Das G, Roy B, Nath S, Naresh R, Kumar S. Prevalence of gastrointestinal parasitic infection in goat of Madhya Pradesh, India. *Journal of Parasitic Diseases*. 2015;39:716-719.
6. Jas R, Ghosh JD, Pandit S, Kumar D, Brahma A, Das S, Das M, Ralte L. Economic impact of gastrointestinal nematodosis in terms of meat production in small ruminants of West Bengal. *International Journal Microbiology Research*. 2017;9(1):834-836.
7. Jas R, Kumar D, Bhandari A, Pandit S. Seasonal alteration in prevalence and intensity of naturally occurring gastrointestinal helminth infection in goats of New Alluvial zone of West Bengal, India. *Biological Rhythm Research*. 2017;48(6): 867-876.
8. Brahma A, Jas R, Das S, Ghosh JD. Prevalence of Gastrointestinal Helminth Infection in Garole Sheep of Sundarban Delta in West Bengal. *Journal of Animal Research*. 2018;8(1):57-60.
9. Sissay MM, Asefa A, Uggl A, Waller PJ. Anthelmintic resistance of nematode parasites of small ruminants in eastern Ethiopia: Exploitation of refugia to restore anthelmintic efficacy. *Veterinary Parasitology*. 2006;135(3-4):337-346.
10. Ram H, Rasool TJ, Sharma AK, Meena HR, Singh SK. Comparative Efficacy of Different Anthelmintics Against Fenbendazole-Resistant Nematodes of Pashmina Goats. *Veterinary Research Communications*. 2007;31:719-723.
11. Gelot IS, Singh V, Shyma KP, Parsani HR. Emergence of multiple resistances against gastrointestinal nematodes of Mehsana-cross goats in a semi-organized farm of semi-arid region of India. *Journal of Applied Animal Research*. 2016;44(1):146-149.
12. Saddiqi HA, Jabbar A, Iqbal Z, Bbar W, Sindhu Z, Abbas RZ. Comparative efficacy of five anthelmintics against trichostrongylid nematodes in sheep. *Canadian Journal of Animal Science*. 2006;86:471-477.
13. Sargison ND, Jackson F, Wilson DJ, Bartley J., Penny CD, Gillear JS. Characterisation of milbemycin-, avermectin-, imidazothiazole- and benzimidazole-resistant *Teladorsagia circumcincta* from a sheep flock. *Veterinary Record*. 2010;29:681-686.
14. Kamaraj C, Rahuman AA, Elango G, Bagavan A, Zahir AA. Anthelmintic activity of botanical extracts against sheep gastrointestinal nematodes, *Haemonchus contortus*. *Parasitology Research*. 2011; 109:37-45.
15. Soulsby E.J.L. *Helminths, Arthropods and Protozoa of Domesticated Animals*. 7th Edition, Balliere, Tindall and Cassel, London; 1982.
16. Coles GC, Jackson F, Pomroy WE, Prichard RK, Samson-Himmelstjerna GV, Silvestre A, Taylor MA, Vercruyse J. The detection of anthelmintic resistance in nematodes of veterinary importance. *Veterinary Parasitology*. 2006;136(3-4):167-185.
17. Verma R, Lata K, Das G. An overview of anthelmintic resistance in gastrointestinal nematodes of livestock and its management: India perspectives. *International Journal of Chemical Studies*. 2018;6(2):1755-1762.
18. Alcalá-Canto Y, Camberos LO, Lopez HS, Olvera LG, Perez GT. Anthelmintic resistance status of gastrointestinal nematodes of sheep to the single or combined administration of benzimidazoles

- and closantel in three localities in Mexico. Veterinaria México OA. 2016;3(4). Available:<https://doi.org/10.21753/vmoa.3.4.374>
19. Brahma A. Studies on prevalence of gastrointestinal parasites in small ruminants and occurrence of benzimidazole resistance using in vivo, in vitro and molecular methods. M.V.Sc. thesis submitted to the West Bengal University of Animal and Fishery Sciences, Kolkata, West Bengal, India; 2013.
20. Jaiswal AK, Sudan V, Shanker D, Kumar P. Emergence of ivermectin resistance in gastrointestinal nematodes of goats in a semi-organized farm of Mathura district – India. Veterinarski Arhiv. 2013;83(3):275-280.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*

<https://prh.ikpress.org/review-history/12312>