



Short Communication

Gastrointestinal Parasites of Non-descript Goats (*capra hircus*) in Semi-Arid Zone of Southern India

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ABSTRACT

The current study was conducted to know the occurrence of gastrointestinal parasitism in two semi-intensive goat farms owned by small-scale farmers of Puducherry, a semi-arid zone of Southern India. The primary aim of this study was to identify the gastrointestinal parasites in non-descript goats of selected farms in Puducherry, a semi-arid zone of Southern India. The samples included 18 goats from Thirukkanur farm, and 7 goats from Kombakkam farm. The goats had a history of recurrent diarrhea, improper vaccination, and deworming status. There was no information on treatment history. Fresh fecal samples (n = 25) were collected per rectum from the non-descript goats belonging to different age groups and sex. The collected fresh fecal samples were processed by qualitative fecal examination, such as direct smear examination, sedimentation, and flotation techniques. Of 25 fecal samples, 23 (92%) samples were found positive. Upon microscopic examination, different gastrointestinal parasites in the non-descript goats of the targeted area include *Strongyles* (68%), *Amphistomes* (48%), *Strongyloides* spp. (36%), *Moniezia* spp. (8%), and *Trichuris* spp. (4%). A higher incidence of gastrointestinal parasites was found in the non-descript goats of the study location. Among these, nematodes constitute about (*Strongyles*, *Strongyloides* spp., *Trichuris* spp.) 80%, trematode (*Amphistomes*) 12%, and cestode (*Moniezia* spp.) 8% were found to be predominant. It is reported that among all the gastrointestinal parasites, the nematode *strongyle* infection is higher in non-descript goats.

1. Introduction

Goats are multi-functional animals and play a significant role in the economy and nutrition of landless, small, and marginal farmers in India¹. Goats are very important livestock in India, mainly due to their short generation intervals and higher prolificacy rates, where the goats and their products can be easily marketed². Many goats are reared in arid areas, and most of them are hardy indigenous breeds, adapted to grazing in degraded environments³. As of 2019, the total Livestock population of India is 535.78 million, and goats constitute about the population of 148.88 million⁴. Goats have the widest ecological range among all species of farm animals and have been poor people's most reliable livelihood resources⁵. The goats can sustain themselves on sparse vegetation and extreme climatic condition². The nondescript population

includes cross-bred populations, a mixture of different breeds or populations that have not yet been studied or described⁶.

Gastroenteritis caused by parasites continues to pose a serious health threat and limitation to the productivity of small ruminants⁷. The prevalence of gastrointestinal helminths is related to agro-climatic conditions like pasture quantity and quality, temperature, humidity, and grazing behavior of the host⁸. Gastrointestinal (GI) parasitism in animals is one the major problems in India, causing emaciation, anemia, edema, weakness, diarrhea, and death in affected animals⁹. The seasonal prevalence of parasitic GI infection is high in monsoon, moderate in summer and low in winter¹⁰. The present study was conducted to know the occurrence of GI parasites in the suspected farms.

2. Materials and Methods

2.1. Ethical approval

The study was conducted based on the ethical guidelines governed by the Rajiv Gandhi Institute of Veterinary Education and Research, India.

2.2. Study area

The study was carried out in the Union Territory of Puducherry, India, in June 2022. The geographical location of Puducherry is situated between 11°42' and 12°30' north latitude and between 76° 36' and 79° 53' east longitude with an area of 294 square kilometers. Puducherry has a semi-arid type of climate with an average elevation of 3 meters from sea level with a mean annual temperature of around 30° C and 70-85 % relative humidity¹¹. It receives rainfall mainly through the North-East monsoon from November to January and from July to September. Puducherry experiences a hot and humid climate for the maximum part of the year, with temperatures varying between 26°C and 38°C. The summer season extends from March to July, and the temperature is within the range of 24.50-38°C¹². The fecal samples were collected from non-descript goats of two different goat owners who had 18 and 7 goats from Thirukkanur and Kombakkam areas, respectively. The samples were collected based on a request for fecal examination from the animal owners to know the reason for recurrent diarrhea in the farms. The animals were serially numbered from 1 to 25 for easy documentation, as no identification tags were available. The age and sex of the animal are presented in [Table 1](#).

2.3. Sample collection

A total of 25 fresh fecal samples (5-7g) were collected per rectum in a screw-type container from the non-descript goats of age groups 1.5 months to 2 years for qualitative fecal examination. The collected samples were marked by the date of sampling, sex, age, and animal identification. The samples were brought to the laboratory of the Department of Veterinary Parasitology, Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry, India, for immediate processing and examination. If processing was not done immediately, the samples were stored at 4°C for 24-48 hours.

2.4. Fecal sample examination

Fecal samples were examined using three methods,

Table 1. Age and sex of the non-descript goats Puducherry, India

Mean age	4.96 (months)
Interval of Age	1.5 -24 months
Male	0.12 ^a
Female	0.88 ^a

^aThe values bearing similar superscripts within a column for each category (age and sex) do not differ significantly at $p < 0.05$

including direct examination, concentration techniques of floatation (saturated salt solution), and sedimentation based on Soulsby (1982). These methods were qualitative, and the results were expressed as the presence or absence of parasitic ova or oocyst.

2.5. Direct smear examination

Normal saline preparation of the fecal sample was prepared for the examination of protozoal cysts and ova of different parasites. For detailed diagnosis, the above preparation was examined initially with a low-power objective (10x) and subsequently with a high-power objective (40x).

2.6. Floatation technique

The samples were processed in a floatation medium (saturated salt solution). About 1-2 gr of the fecal sample was triturated in a mortar and pestle with the addition of a little saturated salt solution. The aliquot was then strained through a sieve, and the filtrate was kept in a floatation tube. The final filling was completed using a dropper until a convex meniscus was produced. A clean microscopic slide was placed over it, and the preparation was let to stand for 10-15 minutes before being swiftly raised, smoothly turned over, covered with a cover slip, and inspected under a microscope.

2.7. Sedimentation technique

Normal saline was used to triturate 1-2 g fecal samples in a mortar and pestle. The suspension was then filtered through a sieve and centrifuged at 2000 rpm for 2 minutes. The supernatant was removed, the sediment was reconstituted, and a drop was taken on a clean glass slide for examination under a microscope. The GI helminth eggs and oocyst were diagnosed based on morphological characteristics¹³.

2.8. Statistical analysis

The data were processed in SPSS (Version 22). The positive percentage of GI parasites was calculated based on the formula n/N , where 'n' is the number of positive samples and 'N' is the number of samples.

3. Results

From the study of 25 fecal samples in two different farms, it was found that 23 (92%) samples were positive for the presence of helminthic infection. The incidence of various GI parasites ([Figure 1](#)) in the non-descript goats of the targeted area found under microscopic examination were *Strongyles* (68%), *Moniezia* spp. (8%), and *Trichuris* spp. (4%) ([Figure 2](#), [Table 2](#)). The occurrence

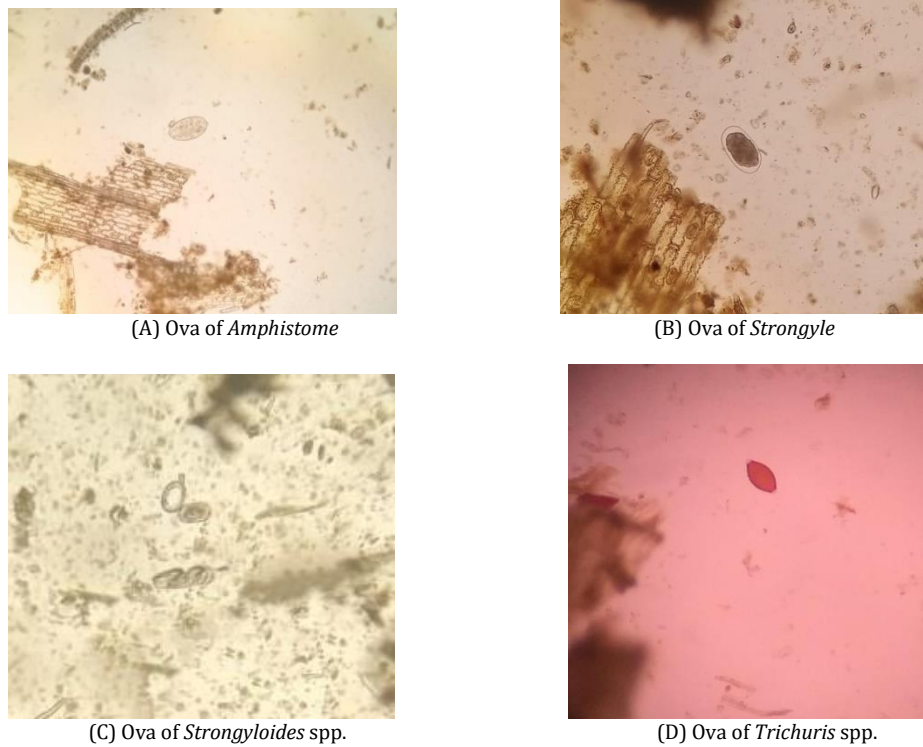


Figure 1. Shapes of different trematode and nematode eggs under microscopic examination
Source: These are representative pictures of different GI parasites in the study

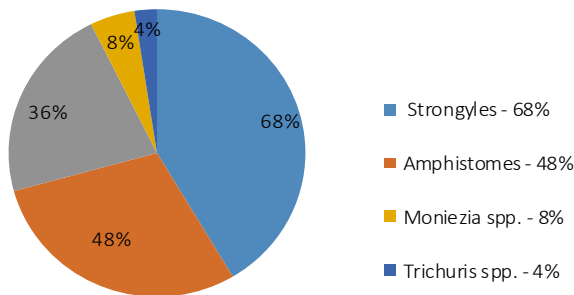


Figure 2. Species wise incidence percentage of gastrointestinal parasites in non-descript goats of selected farms Puducherry, Southern India

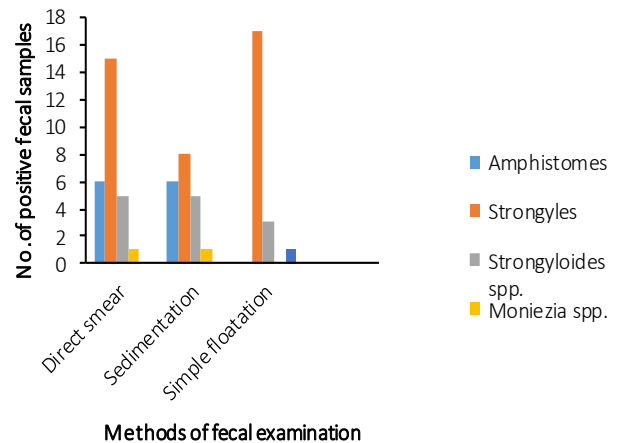


Figure 3. Comparison of gastrointestinal parasites by different methods of qualitative fecal examination in non-descript goats of selected farms of Puducherry, Southern India

of GI parasites by different fecal examinations is presented in [Figure 3](#).

Table 2. Occurrence of different gastrointestinal parasites in non-descript goats of selected farms of Puducherry, Southern India

Parasite	No. of positive gastrointestinal parasites	Positive fecal percentage in total positive samples
<i>Amphistomes</i>	12	48
<i>Strongyles</i>	17	68
<i>Strongyloides</i> spp.	9	36
<i>Moniezia</i> spp.	2	8
<i>Trichuris</i> spp.	1	4

No: Total number of fecal samples collected (n = 25)

4. Discussion

This study revealed that 92% of the samples were positive for GI parasites. The rest 8% of the samples did not show any presence of parasitic infection. Of all, *Strongyles* (68%), *Amphistomes* (48%), *Strongyloides* spp. (36%), *Moniezia* spp. (8%), *Trichuris* spp. (4%) were found to be more prevalent among the non-descript goats of the different age groups. Among the GI parasites, nematodes (80%) were found to be predominantly followed by trematode (12%) and cestode (8%). In this study, the GI nematodes, mainly the strongyle infection, were higher since it is one of the most pathogenic species affecting

small ruminants globally¹⁴. The higher incidence of GI parasites in the study area was attributed to environment and management practices. The farmer in the study area allows the animals for partial grazing, which heavily contributes to the parasitic infection due to pasture contamination. Furthermore, the small-scale farmers did not follow any deworming practices or prophylactic treatment in the study location.

Parasite control in ruminant livestock is the first-order input in any sustainable animal production system¹⁵. The parasitic GI infection is higher in monsoon, moderate in summer, and lower in winter. Prevalence during winter may be low due to reduced grazing hours of the animals, as the chances of contact between the host and parasites decrease¹⁰.

Parasitic nematodes of the GI tract remain a major constraint associated with breeding. The overall prevalence of GI parasites declares the infection intensity in the goats¹⁷. The most important endoparasitic diseases in goats are parasitic gastroenteritis caused by GI nematodes¹⁸. Parasitic gastroenteritis (PGE) is one of the most important causes of economic loss and weight loss in small ruminants, particularly in young animals, because of lowered immunity that results in infection and subsequent mortality^{19, 20}. The financial losses due to GI parasitism include both direct and indirect losses, such as reduced level of fertility, feed intake, weight gain, milk production, potential productivity, and feed conversion of small ruminants²¹. Seasonal dynamics and age of the host animals significantly influence the prevalence of GI parasite infection and the intensity of the worm population²². Environmental factors, including agroecological conditions and animal husbandry practices, can also determine the incidence and severity of various parasitic diseases²³. This study shows the presence of mixed infections in non-descript goats. Periodical assessment for the prevalence of parasitic GI diseases among goat farms necessitates monitoring the efficacy of the control programs²⁴. Parasitic gastroenteritis continues to pose a severe health threat and limitation to the productivity of small ruminants²⁵. There is very limited information about the management and control of parasites in the study area, and data is not available about the most common parasites present in goats in the study area. Hence, management practices are an essential alternative to improve controlling of GI parasites in goats²⁶.

5. Conclusion

The findings indicated a higher incidence of GI parasites in the non-descript goats. The predominant nematodes constitute *Strongyles*, *Strongyloides* spp., and *Trichuris* spp. for 80%, trematode (*Amphistomes*) for 12%, and cestode (*Moniezia* spp.) for 8%. Hence, animal husbandry practices, such as reducing the stocking density, better plan of animal nutrition, proper deworming intervals, good pasture management, and rational use of anthelmintics without overusing, can limit the infection of gastrointestinal parasitism and mortality among the goats. Furthermore,

detailed research should be done to know the epidemiological prevalence of parasitic infection in goats of Puducherry, India.

Declarations

Competing interests

The authors declared that they have no conflict of interest.

Authors' contribution

The authors Devadharshini J and Das. SS conceived the concept. Devadharshini. J and Mathivathani C conducted the study, generated data, and did the statistical analysis. All three authors contributed equally to drafting this manuscript and proofreading it for submission to the journal.

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Ethical consideration

The authors wish to confirm that there is no conflicts of interest associated with this publication and confirm that the manuscript has been read and approved by all named authors. All authors consented to publish this article and confirm that there is no any plagiarised information in the article.

References

1. Thiruvankadan AK. Improvement in rural livelihood through dairy goat farming in India. First Asia Dairy Goat Conference; 2012 Apr 9; 9: 174. Available at: <http://www.capridairyworld.org/files/pdf/1st-Asia-Dairy-Goat-Conf-Proceedings-12.pdf>
2. Kumar S, and Pant KP. Development perspective of goat rearing in India: status, issues and strategies. Indian J Agric Econ. 2003; 58(4):752-67. Available at: <https://ageconsearch.umn.edu/record/297985/files/ijae-616.pdf>
3. Capote J. Environments and goats around the world: Importance of genetic and management factors. In: Kukovics S, editor. Sustainable goat breeding and goat farming in central and Eastern European countries. Food and Agriculture Organization of the United Nations: Rome, Italy. 2016. p. 1-6. Available at: <https://www.fao.org/3/i5437e/i5437e.pdf>
4. Provisional key results of 20th Livestock Census. Department of Animal Husbandry and Dairying of India. [cited 2022, September 16]; Available at <https://www.dahd.nic.in/division/provisional-key-results-20th-livestock-census>
5. National action plan on goat. Department of Animal Husbandry and Dairying Government of India; 2019 [cited 2022 September 16]. Available at: [https://dahd.nic.in/sites/default/files/NAP%20on%](https://dahd.nic.in/sites/default/files/NAP%20on%20goat.pdf)

- 20Goat.pdf
6. Mishra P, Ali SA, and Verma NK. On the population and characteristics of descript and non-descript goats of India. *Biosci Biotech Res Comm*. 2015; 8(2): 213-216. Available at: <https://bbrc.in/bbrc/papers/pdf%20files/Volume%208%20-%20No%202%20-%202015/20.pdf>
 7. Jegede OC, Adejoh AA, Obeta SS, and Olayemi OD. Gastrointestinal parasites of sheep and goats in Gwagwalada Area Council, Federal Capital Territory, Abuja, Nigeria; with a special reference to sex, breed and age. *AJVS*. 2015; 46(1): 170-176. DOI : <https://www.doi.org/10.5455/ajvs.177135>
 8. Pal RA, and Qayyum MA. Distribution of gastrointestinal amphistomes and cestodes in small ruminants grazed on irrigated and non-irrigated pasture zones. In *Proceedings of Pakistan Congress of Zoology*; 1993. 13: 307-313.
 9. Singh AK, Das G, Roy B, Nath S, Naresh R, and Kumar S. Prevalence of gastrointestinal parasitic infections in goats of Madhya Pradesh, India. *J Parasit Dis*. 2015; 39(4): 716-719. DOI : <https://doi.org/10.1007/s12639-014-0420-z>
 10. Pathak AK, and Pal S. Seasonal prevalence of gastrointestinal parasites in goats from Durg district of Chhattisgarh. *Vet world*. 2008; 1(5): 136-137. Available at: <http://www.veterinaryworld.org/2008/May/Seasonal%20Prevalence%20of%20Gastrointestinal%20Parasites%20in%20Goats%20f.pdf>
 11. Puducherry district. Government of Puducherry India [cited 2022 Sep 16]. Available at: <https://puducherry-dt.gov.in/>
 12. Pondicherry geography and history. *Maps of India*. 2013 [cited 2022 Sep 16]. Available at: <https://www.mapsofindia.com/pondicherry/geography-history.html>
 13. Soulsby E JL. *Helminths, protozoa and arthropods of domesticated animal*. 7th ed. London: Bailliere Tindall, 1982. p.763-777.
 14. Paul BT, Jesse FF, Chung EL, Che'Amat A, and Mohd Lila MA. Risk factors and severity of gastrointestinal parasites in selected small ruminants from Malaysia. *Vet Sci*. 2020; 7(4): 208. DOI: <https://www.doi.org/10.3390/vetsci7040208>
 15. Bukhari S, and Sanyal PK. Epidemiological intelligence for grazing management in strategic control of parasitic gastroenteritis in small ruminants in India-A Review. *Vet World*. 2011; 4(2): 92-96. Available at: <https://agris.fao.org/agris-search/search.do?recordID=IN2013000387>
 16. Torres-Acosta JF, and Hoste H. Alternative or improved methods to limit gastrointestinal parasitism in grazing sheep and goats. *Small Rumin Res*. 2008; 77(2-3): 159-73. DOI : <https://doi.org/10.1016/j.smallrumres.2008.03.009>
 17. Hassan NM, Farag TK, Abu El Ezz NM, and Abou-Zeina HA. Prevalence assessment of gastrointestinal parasitic infections among goats in Giza Governorate, Egypt. *Bull Natl Res Cent*. 2019; 43: 127. DOI : <https://www.doi.org/10.1186/s42269-019-0151-5>
 18. Taylor M. *Parasite of goats : A guide to diagnosis and control* . In *practice*. 24(2): 76-89. DOI: <https://www.doi.org/10.1136/inpract.24.2.76>
 19. Jesse FF, Bitrus AA, Chung EL, Peter ID, Mohd MA, and Salleh LA. Severe parasitic gastroenteritis (PGE) in a goat: A veterinary case report and way forward. *The Thai J of Vet Med*. 2019; 49(3): 295-299. Available at: <https://he01.tci-thaijo.org/index.php/tjvm/article/view/230636/156959>
 20. Githigia SM, Thamsborg SM, Munyua WK, and Maingi N. Impact of gastrointestinal helminths on production in goats in Kenya. *Small Rum Res*. 2001; 42(1): 21-29. DOI : [https://www.doi.org/10.1016/S0921-4488\(01\)00240-1](https://www.doi.org/10.1016/S0921-4488(01)00240-1)
 21. Moje N, Gurmessa A, and Regassa G. Gastrointestinal tract nematodes of small ruminants: Prevalence and Their identification in and around Alage, Southern Ethiopia. *Animal and Vet Sci*. 2021; 9(3): 65-72. DOI : <https://www.doi.org/10.11648/j.avs.20210903.14>
 22. Tariq KA, Chishti MZ, and Ahmad F. Gastrointestinal nematode infections in goats relative to season, host sex and age from the Kashmir valley, India. *J Helminthol*. 2010; 84(1): 93-7 DOI : <https://www.doi.org/10.1017/S0022149X09990113>
 23. Badran I, Abuamsha R, Aref R, Alqisi W, and Alumor J. Prevalence and diversity of gastrointestinal parasites in small ruminants under two different rearing systems in Jenin district of Palestine. *An - Najah Univ J Res*. 2012; 26(1): 1-8. Available at: https://journals.najah.edu/media/journals/full_texts/prevalence-and-diversity-gastrointestinal-parasites-small-ruminants-under-two-different-rearing-syst.pdf
 24. Hassan NMF, Farag TK, Abu El Ezz NMT, and Abou-Zeina HAA. Prevalence assessment of gastrointestinal parasitic infections among goats in Giza Governorate, Egypt. *Bull Natl Res Cent*. 2019; 43: 127. DOI : <https://www.doi.org/10.1186/s42269-019-0151-5>
 25. Wondmnew K, Temesgen W, Hussien M, and Arega Y. Study on prevalence of ovine paramphistomiasis in Kutaber Woreda, South Wollo, Amhara Region, Ethiopia. *J Biosci Biotechnol Discv*. 2019; 4(4): 84-87. Available at : <https://integrityresjournals.org/journal/JBBD/article-full-text-pdf/5D2831734>
 26. NorAzlina AA, Sani RA, and Ariff OM . Management practices affecting helminthiasis in goats. *Pertanika J Trop Agric Sci*. 2011; 34(2): 295-301. Available at: <http://psasir.upm.edu.my/id/eprint/58202/1/JTAS%20Vol.%2034%20%282%29%20Aug.%202011%20%28View%20Full%20Journal%29.pdf#page=105>