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Prevalence of gastrointestinal helminths in goats of Tirupathur block, Sivaganga District, Tamil Nadu

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Abstract
Gastrointestinal helminths significantly affect goat health and productivity, leading to economic losses for farmers. This study aimed to determine the prevalence, species composition, and risk factors associated with helminth infections in goats of Tirupathur Block, Sivaganga District Tamil Nadu. A total of 250 fecal samples were collected and examined using flotation, sedimentation, and McMaster techniques. The overall prevalence was 68.4%, with *Strongyle* spp. (45.2%), *Trichuris* spp. (12.8%), *Moniezia* spp. (7.6%), and *Fasciola* spp. (2.8%) being the most common. Infection was significantly higher in grazing goats (75.5%) compared to stall-fed goats (42.1%) ($p<0.05$). The highest prevalence was observed in the monsoon season (82.2%), followed by winter (63.7%) and summer (57.5%). Strategic deworming, improved pasture management, and farmer awareness programs are essential to control helminth infections in the region.

Keywords: Tamil Nadu, Helminthiasis, Strongyles, goat parasites, epidemiology

Introduction
Goats play a crucial role in India's rural economy, particularly in Tamil Nadu, where they are raised for meat, milk, and fiber (FAO, 2021) [2]. The economic contribution of goats extends beyond direct income, as they also serve as a source of livelihood and nutritional security for small-scale farmers. However, gastrointestinal helminth infections remain a major constraint in goat farming, leading to reduced weight gain, anemia, diarrhea, and mortality (Soulsby, 1982) [4]. These infections adversely impact productivity by impairing digestion, reducing feed efficiency, and increasing susceptibility to secondary infections. Helminth transmission depends on factors such as climate, grazing management, and host immunity (Taylor *et al*, 2016) [5]. Favorable environmental conditions, including high humidity and moderate temperatures, facilitate the survival and development of infective helminth larvae, leading to increased infection rates in grazing goats. Studies in Tamil Nadu have reported prevalence rates ranging from 50% to 85%, but data specific to Tirupathur Block, Sivaganga District, is lacking (Varadharajan and Vijayalakshmi, 2015) [6]. This study aimed to assess the prevalence, species composition, and risk factors associated with gastrointestinal helminths in local goat populations, thereby contributing to improved parasite control strategies and sustainable goat farming practices.

Materials and Methods
Study Area
The study was conducted in Tirupathur Block, Sivaganga District, Tamil Nadu (9.85°N, 78.48°E), which has a tropical climate with average temperatures of 28 °C to 35 °C and moderate rainfall. Goat farming in this region follows extensive and semi-intensive systems.

Sample Collection and Examination
A total of 250 fresh fecal samples were randomly collected from goats in different villages. Samples were analyzed using:

- **Flotation Method:** The flotation technique was used to detect nematode and cestode eggs, including *Strongyle spp.*, *Trichuris spp.*, and *Moniezia spp.*

The method involved mixing fecal samples with a saturated salt solution (specific gravity 1.2) and centrifuging the mixture to allow parasite eggs to float and be observed under a microscope. This technique is widely used for its sensitivity and effectiveness in detecting lighter helminth eggs that float on the solution surface (Zajac and Conboy, 2012) [7].

- **Sedimentation Method:** The sedimentation technique was employed to detect trematode eggs, specifically *Fasciola spp.* Fecal samples were mixed with water, strained, and allowed to settle in a test tube. The sediment was then transferred to a slide and examined under a microscope. This method is particularly effective for detecting heavier eggs that do not float in common flotation solutions and is frequently used for diagnosing fascioliasis in ruminants (Foreyt, 2001) [3].
- **McMaster Technique:** The McMaster method was used to quantify helminth egg burden by determining the number of eggs per gram (EPG) of feces. A measured amount of feces was mixed with a flotation solution, and a fixed volume was loaded into a McMaster counting chamber. The number of eggs observed under a microscope was multiplied by a predetermined factor to estimate the EPG count. This method provides an accurate estimate of infection intensity and is commonly used in epidemiological studies (Coles *et al*, 1992) [1].

Statistical Analysis

Prevalence (%) was calculated using the formula:-

Prevalence = (Number of Infected Goats / Total Examined Goats) × 100

Chi-square test (χ^2) was used to analyze associations between age, sex, and management practices. p-values < 0.05 were considered statistically significant.

Results and Discussion

Overall Prevalence of Helminths

Out of 250 samples examined, 171 were found positive for helminth infections, resulting in an overall prevalence of 68.4%.

Table 1: Species-wise distribution of Helminths

Helminth Species	Prevalence (%)
Strongyle spp.	45.2
Trichuris spp.	12.8
Moniezia spp.	7.6
Fasciola spp.	2.8

Strongyle spp. had the highest prevalence (45.2%), indicating high fecal contamination of pastures. Similar results were reported by Varadharajan and Vijayalakshmi (2015) [6], where *Strongyle spp.* dominated the helminth fauna in goats from Tamil Nadu.

Risk Factor Analysis

Grazing goats had significantly higher prevalence (75.5%) than stall-fed goats (42.1%), (p<0.05), emphasizing the role of contaminated pastures. Taylor *et al* (2016) highlighted that unrestricted grazing in humid environments leads to higher parasite burdens.

The highest prevalence occurred in monsoon (82.2%), attributed to increased moisture favoring larval survival (Soulsby, 1982) [4].

Table 2: Seasonal variation in Helminth Infections

Season	Prevalence (%)
Monsoon	82.2
Winter	63.7
Summer	57.5

Table 3: Impact of anthelmintic use

Deworming Status	Prevalence (%)
Dewormed	44.6
Non-dewormed	82.3

Only 41.2% of goat owners used deworming programs, contributing to high parasite loads. Infection prevalence in dewormed goats was 44.6%, whereas in non-dewormed goats it was 82.3%, demonstrating the effectiveness of regular deworming. Studies confirm that biannual deworming can significantly reduce parasite loads. The study underscores a significant prevalence of gastrointestinal helminths in goats of Tirupathur Block, highlighting the necessity for comprehensive control strategies to mitigate the associated economic and health impacts. The presence of various helminth species, including nematodes, cestodes, and trematodes, suggests that multiple factors contribute to the high infection rates observed. These include climatic conditions favorable for parasite development, traditional grazing practices, and limited access to anthelmintic treatment among local farmers.

Importance of Strategic Deworming

Strategic deworming plays a critical role in reducing helminth burdens in goats. Regular and targeted anthelmintic treatment can significantly lower parasite loads, thereby improving overall animal health and productivity. However, indiscriminate use of anthelmintics can lead to the emergence of drug-resistant parasite strains. Therefore, a well-planned deworming schedule, based on epidemiological data and fecal egg count monitoring, should be adopted. Integration of Targeted Selective Treatment (TST) approaches, where only heavily infected animals receive anthelmintics, can also help in minimizing resistance development while maintaining effective parasite control.

Role of pasture management

Improved pasture management is essential in breaking the transmission cycle of gastrointestinal helminths. Helminth larvae typically develop and survive in the environment before infecting new hosts, making grazing areas a key factor in parasite transmission. Rotational grazing, where animals are moved between different pastures, can reduce parasite reinfection rates. Additionally, maintaining optimal pasture hygiene, avoiding overstocking, and introducing mixed grazing systems with other livestock species can further reduce the risk of helminth infections.

Farmer education and awareness

Farmer education is a cornerstone in the effective control of gastrointestinal parasites. Many small-scale goat farmers may lack awareness regarding the economic impact of parasitic infections and the best practices for helminth control. Extension programs should focus on educating farmers about the importance of routine fecal examinations, correct anthelmintic usage, pasture management strategies, and the signs of parasitic infections. Training sessions, workshops, and distribution of informational materials can empower

farmers with the necessary knowledge to implement effective parasite control measures.

Need for Integrated Parasite Management (IPM)

An integrated parasite management (IPM) approach is necessary to ensure long-term control of gastrointestinal helminths in goats. IPM involves a combination of strategies, including rotational deworming with different drug classes, use of herbal or biological dewormers, genetic selection for parasite-resistant goats, and improved nutrition to enhance immune function. Encouraging the adoption of sustainable and holistic control measures can significantly reduce the reliance on chemical dewormers while maintaining herd health.

Implications for goat health and productivity

High parasite burdens negatively impact goat health by causing weight loss, poor body condition, anemia, diarrhea, and reduced reproductive performance. Chronic helminth infections can also lower immunity, predisposing animals to secondary infections. Effective parasite control strategies will not only improve individual animal health but also enhance overall herd productivity, leading to better economic returns for farmers.

Conclusion

In conclusion, the high prevalence of gastrointestinal helminths in goats of Tirupathur Block necessitates a multi-faceted approach to parasite control. Strategic deworming, improved pasture management, and farmer education are fundamental to reducing infection rates. By adopting an integrated and sustainable approach, it is possible to minimize the impact of helminths, enhance goat health, and improve livestock productivity in the region.

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