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Research Paper

Gastrointestinal parasites in small ruminants in the Urban Commune of Tillaberi, Niger

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Abstract
This study aimed to determine the prevalence of gastrointestinal parasites in domestic ruminants as a contribution to improving public health. A total of 200 sheep and 100 goats were randomly sampled in Toula, Tillakaina, Garié Daykaina, Daybéri and Foulé. Faecal samples were examined using the sedimentation technique to detect nematode and cestode eggs, as well as coccidian oocysts. Parasite egg enrichment was performed by suspending 5 g of faeces in 100 ml of tap water to concentrate trematode, cestode and nematode eggs. Microscopic examination was carried out using ×10 and ×40 objectives for screening and identification. Sheep and goats showed high infestation rates of 96.5% and 93%, respectively. The highest prevalence in sheep was observed in Daybéri (100%), Garié (100%), Foulé (97.29%) and Daykaina (97.29%). All goats sampled in Foulé and Tillakaina were also infested (100%). All categories of sheep were affected, and younger goats showed higher infestation levels. Six parasite groups were identified: tapeworms, strongyles, Paramphistomum spp., Fasciola spp., Eimeria spp. and Schistosoma spp. Eimeria spp. was the most prevalent, followed by strongyles and tapeworms. These findings demonstrate a high burden of gastrointestinal parasites in domestic ruminants in the study area, particularly in sheep and goats.
Keywords: *Parasite; Prevalence; Sheep; Goat; Niger.*

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I. Introduction

Livestock production is a key sub-sector in Niger, contributing 13% of GDP and 40% of agricultural GDP, while supplying 25% of household food needs (MEL-Niger, 2013; FAO, 2017). Beyond providing high-nutritional-value products, it generates substantial rural employment and income and represents the country's second-largest source of export revenue after mining. Small ruminants are particularly important due to their short reproductive cycles, high prolificacy, and simple management (Tanguy, 2011; Meradi, 2012; Moussouni et al, 2018). Herd sizes are increasing annually, yet production is constrained by recurrent droughts, land competition, and frequent diseases, especially gastrointestinal parasitoses (Abdou, 2014; Tembasa et al., 2022).
Gastrointestinal parasites, including helminths (nematodes, cestodes, trematodes) and protozoa, are a major cause of morbidity and economic loss in domestic ruminants, with potential zoonotic transmission to humans via contaminated food, water, or direct skin contact (Archie et al., 2006; Eichstadt, 2017. Mbouombouo et al., 2020). In tropical regions, these infections cause diarrhoea and abdominal disorders and are transmitted orally or transcutaneously (Thienpoint et al., 1979; Faihun,et al., 2017; Alpha et al., 2019; Gragnon et al., 2020). In Tillaberi, gastrointestinal parasites remain poorly documented. A study on draught oxen in Toula, Daykaina, and Daybéri reported Fasciola, Paramphistomum, Schistosoma, gastrointestinal strongyles, tapeworms, and coccidian oocysts (Colé, 2016 ; Arbi, 2018). This study was conducted to assess the prevalence of gastrointestinal parasites in small ruminants in the region, aiming to improve understanding of their impact on animal health and public health.

II. Materials And Methods

2.1. Study Area

2.1.1. Geographical location

The urban commune of Tillabéri (Figure 1) is located 115 km from the capital Niamey in the western part of the country between coordinates 1° and 2° longitude East; 14° and 16° latitude North.

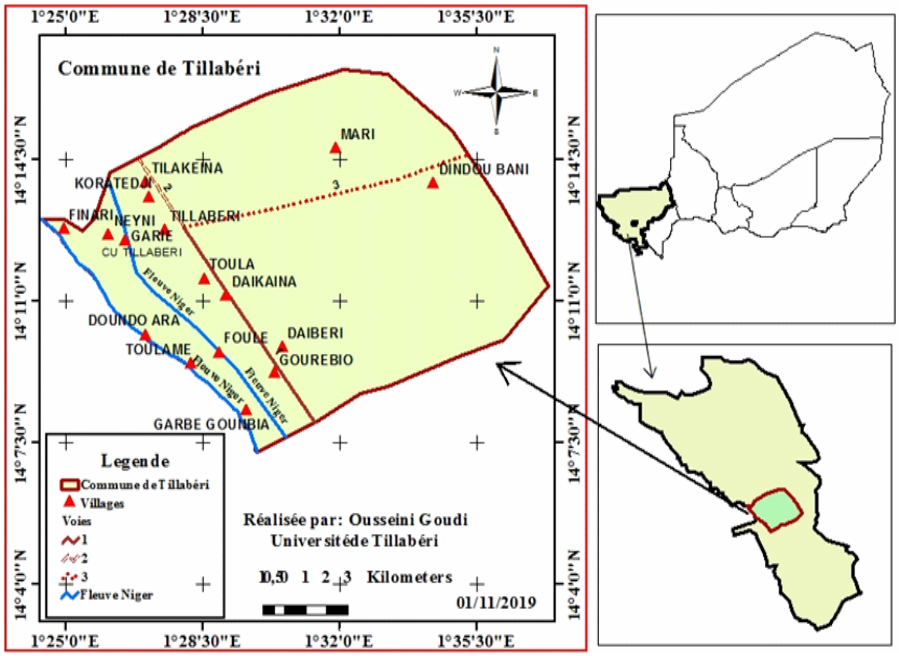

Figure 1: Geographical location of the urban district of Tillaberi

2.1.2. Climate

The urban district of Tillabéri has a Sahelian climate, with an average annual rainfall of 352.7 mm. It features two distinct seasons: a wet season from May to September, lasting 4–5 months, and a longer dry season divided into a cold period (October–February) and a hot period (March–May). Average temperatures range from 25°C (minimum) to 45°C (maximum).

2.1.3. Vegetation

Vegetation is dominated by thorny trees, mainly Acacia spp. and Balanites aegyptiaca, resulting from reforestation and natural regeneration in lowlands and dunes. Combretaceous species are rare and scattered over plateaus and slopes. Herbaceous vegetation is dominated by Echinochloa stagnina and Cenchrus biflorus, with some invasive species such as Sida cordifolia and water hyacinth. Certain species, including Vitex doniana and wild grape, are threatened with extinction.

2.1.4. Agriculture

Agriculture is the primary economic activity, employing 90% of the working population. Two main systems exist: rain-fed and irrigated. Rain-fed farming focuses on cereals (millet, sorghum, rice) often intercropped with legumes (especially cowpea), and minor crops such as sesame and okra, predominantly managed by women. Irrigated agriculture occurs mainly in the river valley, including rice, horticulture, and fruit trees, across 12 sites covering 238 ha.

2.1.5. Livestock farming

Livestock production involves both men and women. Men primarily manage large livestock (cattle), while women focus on small ruminants (sheep and goats). Animals graze under supervision and may receive supplementary feed at night. In high-risk areas, livestock are kept in cultivated fields, allowing them to utilize crop residues.

2.2. Material and Methods

2.2.1. Study population

The study was conducted on domestic small ruminants—200 sheep and 100 goats—from urban and peri-urban farms in Toula, Tillakaina, Garié, Daykaina, Daybéri, and Foulé, within the commune of Tillabéri. Animals were randomly selected, without regard to sex or age, with a focus on individuals exhibiting digestive symptoms (diarrhoea, anorexia, cachexia, etc.).

2.2.2. Sample collection

Fresh faecal samples were collected directly from the rectum using gloved hands and plastic bags. The samples were labelled, stored in a cool box, and transported to the regional veterinary laboratory in Tillabéri. Samples were either examined immediately or stored briefly depending on volume.

2.2.3. Coproscopic analysis

Faecal examination was conducted using the sedimentation concentration method:

- Weigh 5 g of faeces.
- Triturate in 100 ml of water using a mortar and pestle; mix thoroughly.
- Filter through a sieve to remove plant debris.
- Allow the solution to stand for 1 hour; helminth eggs sediment at the bottom.
- Carefully discard the supernatant, retaining the pellet with minimal liquid; mix gently.
- Place a drop of sediment on a slide and cover with a 22 × 22 mm coverslip, avoiding air bubbles.
- Examine under a light microscope using ×10 (screening) and ×40 (identification) objectives.

2.2.4. Prevalence calculation

The prevalence of infestation by parasite species and sampling site was calculated as:

2.2.5. Data analysis

Field data were recorded and processed using Microsoft Word and Excel.

III. Results

Overall prevalence: Of the 300 faecal samples examined from sheep and goats, 286 were positive for gastrointestinal parasites, yielding an overall prevalence of 95.33%.

Table 1: Overall prevalence of infestations

Number of samples	Number of positive cases	Prevalence (%)
300	286	95.33

3.1. Prevalence of Infestation by Animal Species

Among the 200 sheep examined, 193 were positive for gastrointestinal parasites, corresponding to a prevalence of 96.5%. In goats, 93 out of 100 individuals were infested, resulting in a prevalence of 93% (Table 2).

Table 2: Prevalence of gastrointestinal parasite infestation by animal species

Animal species	Number of samples	Number of positive cases	Prevalence (%)
Sheep	200	193	96.5
Goats	100	93	93
Total	-	-	-

3.2. Prevalence of sheep infestations by locality

Figure 2 shows the prevalence of sheep infestations according to sampling site. It can be seen that of the six (6) localities sampled, sheep in Garié and Daybéri were the most infested with digestive tract parasites, with a prevalence of 100% each. Sheep in Daykaina and Foulé were also heavily infested, with a prevalence of 97.29% each, followed by Toula (94.59%) and Tillakaina (92.68%).

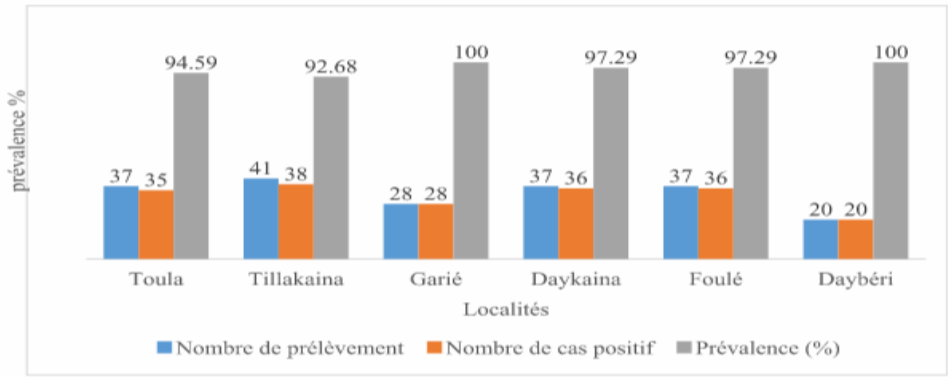

Figure 2: Prevalence of ovine infestations by locality

3.3. Prevalence of goat infestations by locality

Figure 3 shows the rate of infestation of the digestive tract according to the sampling sites. Goats were 100% infested with gastrointestinal parasites in Tillakaina and Foulé. It was also very high in Toula (92.31%), Daykaina (92.31%), Garié (90.9%) and Daybéri (90%).

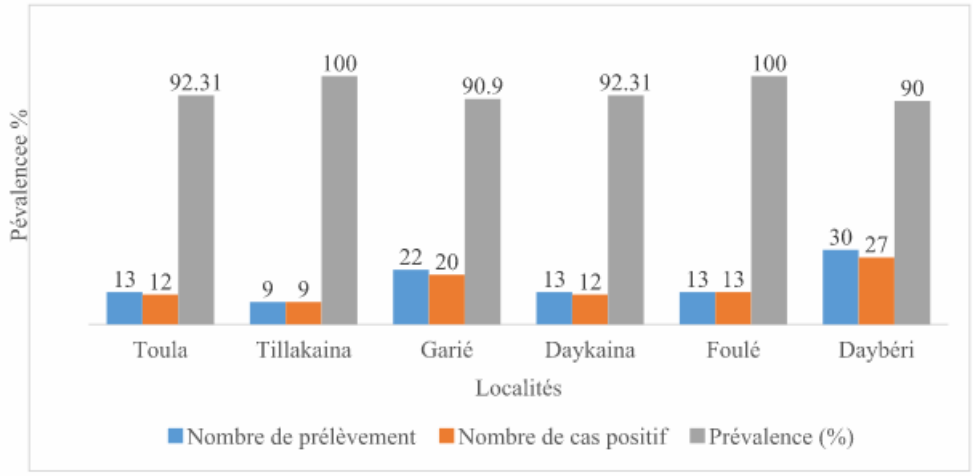

Figure 3: Prevalence of goat infestations according to locality

3.4. Prevalence of ovine infestations of gastrointestinal parasites according to physiological stage

The prevalence of ovine infestations of gastrointestinal parasites according to physiological stage is shown in Table 3. All categories of sheep were infested with gastrointestinal parasites. The very high infestation of gastrointestinal parasites was observed in lambs/lambs and antennae/antennae. Rams/ewes (95.88%) were the least infested with gastrointestinal parasites in comparison. Males (97.14%) were more infested than females (96.15%).

Table 3: Prevalence of gastrointestinal parasite infestations in sheep according to physiological stage and sex

Parameters		Number of samples	Number of positive cases	Prevalence (%)
AGE	Lamb/ling 0- 3 months	11	11	100
	Antenais/antenaise 3 months - 1 year	19	19	100
	Ram/ewe Over one year old	170	163	95.88
	Subtotal 1	-	-	-
SEX	Male	70	68	97.14
	Female	130	125	96.15
	Subtotal 2	-	-	-

3.5. Prevalence of gastrointestinal parasite infestations in goats as a function of physiological stage and sex

Of the goats analysed, kids and one-year-olds were 100% infested with digestive tract parasites (Table 4). On the other hand, billy goats (90.54%) were the least infested. In terms of goat gender, males were the most infested with digestive tract parasites (DTP). The prevalence of infestation was 95.74% in males compared with 90.57% in females.

Table 4: Prevalence of gastrointestinal parasite infestations in goats according to physiological stage sex

Parameters		Number of samples	Number of positive cases	Prevalence (%)
AGE	Kids	13	13	100
	1 year	13	13	100
	Goat	74	67	90.54
	Subtotal	100	93	-
SEX	Male	47	45	95.74
	Femelle	53	48	90,57
	Sous total	100	93	-

3.6. Prevalence of ovine infestations according to digestive tract parasite

A total of six (6) gastrointestinal parasites (Eimeria SPP, Strongyles, Taenia, Paramphistomum SPP, Fasciola SPP and Schistosoma SPP) were identified in the sheep diagnosed. Of these parasites, Eimeria SPP was identified as the parasite that infested the most sheep. The prevalence of infestation for the latter was 35.04%, followed respectively by strongyles (30.69%) and tapeworms (21.48%). Paramphistomums SPP (5.88%), Fasciola SPP (5.12%) and Schistosoma SPP (1.79%) infested sheep to a lesser extent (Figure 4).

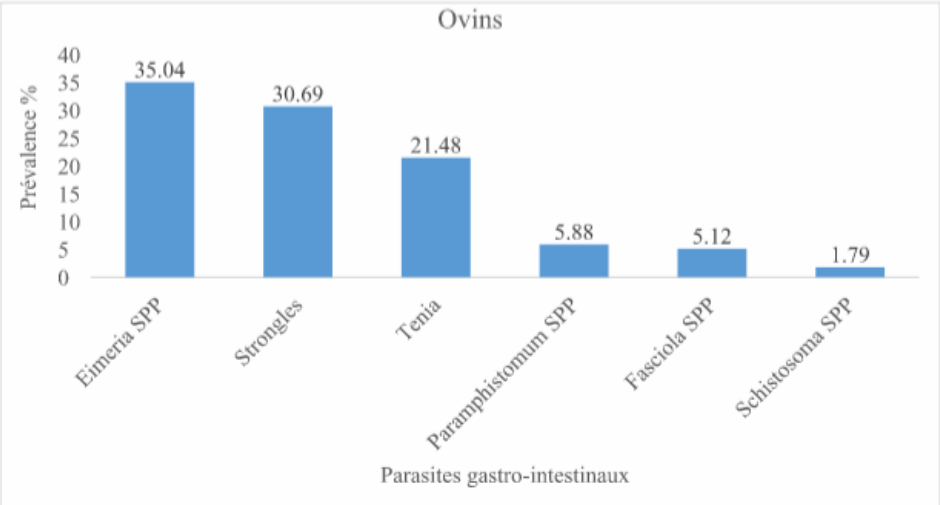

Figure 4: Prevalence of sheep infestations according to digestive tract parasite

3.7. Prevalence of goat infestations according to digestive tract parasite

For all goats diagnosed, six (6) gastrointestinal parasites were identified. These were: Fasciola SPP, Paramphistomum SPP, Schistosoma SPP, Eimeria SPP, Taenia and strongle. Of these parasites, Eimeria SPP and strongle infested more goats (36.70% and 30.85% respectively), followed by tapeworms (21.28%). Fasciola SPP (5.26%), Paramphistomum SSP (5.25%) and Schistosoma SPP (2.66%) infested goats to a lesser extent (Figure 5).

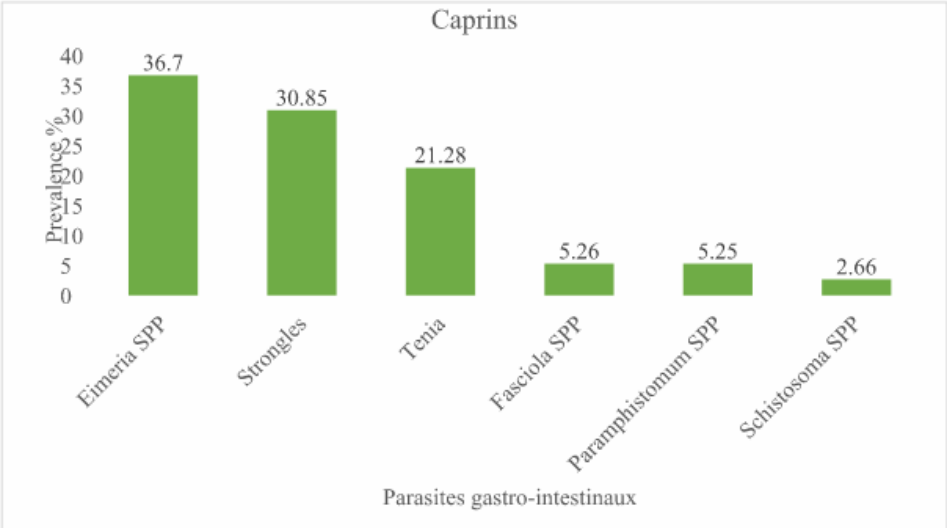

Figure 5: Prevalence of goat infestations according to digestive tract parasite

3.8. Prevalence of the type of ovine infestation according to locality

Among the parasites identified, Fasciola SPP, Eimeria spp, tapeworm, strongle and Paramphistomum spp were observed in sheep in all six (6) localities sampled (Toula, Tillakaina, Garié, Daykaina, Foulé and Daybéri). Prevalence varied according to the type of parasite and the locality (Table 5). Sheep in Foulé were the most infested with gastrointestinal parasites, with a high prevalence of Paramphistomum SPP (52.17%).

Table 5: Prevalence of type of sheep infestation according to locality

Parasite du tube digestif	Toula	Tillakaina	Garié	Daykaina	Foulé	Daybéri
Fasciola SPP	10 (2/20)	10 (2/20)	25 (5/20)	15 (3/20)	30 (6/20)	10 (2/20)
Eimeria SPP	13,87 (19/137)	18,25 (25/137)	17.51 (24/137)	16,79 (23/137)	21,17 (29/137)	12,41 (17/137)
Ténia	16,67 (14/84)	14,29 (12/84)	13,10 (11/84)	16,66 (14/84)	26,19 (22/84)	13,10 (11/84)
Strongle	20,83 (25/120)	20 (24/120)	10,84 (13/120)	16,67 (20/120)	22,5 (27/120)	9,17 (11/120)
Paramphistomum SPP	4,35 (1/23)	4,35 (1/23)	17,39 (4/23)	17,39 (4/23)	52,17 (12/23)	4,35 (1/23)
Schistosoma SPP	0 (0/7)	0 (0/7)	0 (0/7)	42,86 (3/7)	42,85 (3/7)	14,29 (1/7)

3.9. Prevalence of Gastrointestinal Parasites in Goats by Locality

All six sampled localities showed infestations in goats with Eimeria spp., tapeworms, and strongyles. Goats from Daybéri were the most affected, with prevalence rates of 42.5% for tapeworms, 34.78% for Eimeria spp., and 27.58% for strongyles. In Garié and Foulé, goats were also highly infested: in Garié, Fasciola spp. and Paramphistomum spp. were recorded at 25% each, while in Foulé, Schistosoma spp. and Paramphistomum spp. reached 60% and 50%, respectively (Table 6).

Table 6: Prevalence of gastrointestinal parasites in goats by locality

Parasite of the digestive tract	Toula	Tillakaina	Garié	Daykaina	Foulé	Daybéri
Fasciola SPP	12.5 (1/8)	0 (0/8)	25 (2/8)	25 (2/8)	25 (2/8)	12.5 (1/8)
Fasciola SPP	14.49 (10/69)	8.70 (6/69)	21.74 (15/69)	8.70 (6/69)	11.59 (8/69)	34.78 (24/69)
Tapeworm	7.5 (3/40)	12.5 (5/40)	12.5 (5/40)	5 (2/40)	20 (8/40)	42.5 (17/40)
Strongle	12.07 (7/58)	10.34 (6/58)	20.69 (12/58)	13.79 (8/58)	15.52 (9/58)	27.58 (16/58)
Paramphistomum SPP	0 (0/8)	0 (0/8)	25 (2/8)	12.5 (1/8)	50 (4/8)	12.5 (1/8)
Schistosoma SPP	0 (0/5)	20 (1/5)	20 (1/5)	0 (0/5)	60 (3/5)	0 (0/5)

IV. Discussion

This study investigated the prevalence of gastrointestinal parasites in sheep and goats from Toula, Tillakaina, Garié, Daykaina, Foulé, and Daybéri in the commune of Tillabéri. Of the 300 samples examined, 286 were positive, resulting in an overall prevalence of 95.33%. This high prevalence likely reflects grazing in areas with climatic conditions favorable to parasite development, poor pasture management, and continuous contamination by parasite larvae. Comparable studies have reported lower prevalence rates, such as 23.24% in sheep and goats in a study by Saibi (2023), while others observed rates as high as 90% in small ruminants (Konaté et al., 2018).

Among the 200 sheep sampled, 193 were infested (96.5%), whereas 93 out of 100 goats were positive (93%). The high infestation rates in both species can be attributed to endemic parasite presence and irregular health monitoring. Similar trends were reported by Saibi (2023), though at lower prevalence.

Spatial analysis revealed that sheep in Garié and Daybéri were the most infested (100%), followed by Daykaina and Foulé (97.29%), Toula (94.59%), and Tillakaina (92.68%). High infestation in these localities is likely due to high animal densities and insufficient prophylactic measures. Goats showed similar patterns, with the highest prevalence in Foulé and Tillakaina (100%) and substantial infestation in Toula (92.31%), Daykaina (92.31%), Garié (90%), and Daybéri (90%). Wide roaming behavior and lack of preventive measures likely contributed to these patterns.

Regarding physiological stage, all categories of sheep were infested, with lambs exhibiting the highest rates (100%). Males were more infested than females, likely due to greater exposure during grazing and limited health monitoring. Among goats, kids and one-year-olds were fully infested (100%), while adults showed slightly lower prevalence (90.54%). These findings align with some previous studies (Chollet et al., 1994; Abdallah & Ibrahim, 2013) but contrast with others, reflecting differences in management and environmental conditions.

Coccidial oocysts (Eimeria spp.) were the most prevalent parasites in both sheep and goats, followed by strongyles and tapeworms. This pattern can be explained by the direct life cycles of these parasites and the high density of hosts in grazing areas. Other parasites, including Fasciola spp., Paramphistomum spp., and Schistosoma spp., were less prevalent, likely due to indirect life cycles requiring intermediate hosts. Poly-parasitism was common, occurring in 69.43% of sheep and 73.12% of goats, while mono-parasitism was observed in 30.57% of sheep and 26.88% of goats. This high diversity reflects exposure to multiple parasites in contaminated grazing environments.

Local variations were observed: sheep in Foulé were particularly affected by Paramphistomum spp. (52.17%), while goats in Daybéri exhibited high infestation with tapeworms (42.5%), Eimeria spp. (34.78%), and strongyles (27.58%). Differences among localities may result from variations in intermediate host availability, grazing practices, and environmental conditions.

Overall, these results underscore the widespread occurrence of gastrointestinal parasites in small ruminants in Tillabéri. They provide important data to support targeted control strategies, veterinary interventions, and further research on parasite management in the region.

V. Conclusion

This study demonstrated a high prevalence of gastrointestinal parasites in sheep and goats in the communes of Toula, Tillakaina, Garié, Daykaina, Foulé, and Daybéri in Tillabéri, Niger. Six parasite groups were identified: tapeworms, strongyles, Paramphistomum spp., Fasciola spp., Eimeria spp., and Schistosoma spp., with Eimeria spp., strongyles, and tapeworms being the most prevalent. Infestation affected all physiological categories, with the highest prevalence observed in young animals and males. Spatial analysis showed significant variation among localities, highlighting areas of high risk. Poly-parasitism was more common than mono-parasitism, reflecting the exposure of animals to diverse parasitic environments. These findings provide scientific support for veterinary practitioners, researchers, and animal health authorities to implement effective monitoring, prophylaxis, and management strategies to reduce gastrointestinal parasitic infections in small ruminants in Tillabéri.

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