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Research Article

Prevalence of Endoparasites in Slaughtered Broiler, Layer, and Local Chickens at Darajani Market, Zanzibar

Zuhura Suleiman Abdalla[1], Rahibu Abdalla Abass[1], Fatma Mohamed Hamdan[1], Yussuf Abdulrahim Yussuf[2], Ali Rashid Rabia[1,*]

[1]Department of Natural Science, State University of Zanzibar, Zanzibar, Tanzania

[2]Zanzibar Agricultural and Livestock Research Institute, Zanzibar, Tanzania

Abstract

Endoparasites are a major threat to poultry health and productivity globally and in Tanzania including Zanzibar. A research gap exists on comparative analyses of distinct endoparasite profiles across the local and exotic chicken types. The main objective of this study was to conduct a comparative analysis of endoparasites in broiler, layer, and local chickens at Darajani chicken slaughter market in Zanzibar. The specific objectives were to assess the prevalence, intensity, and types of endoparasites in slaughtered chickens, assess species diversity and, explore links between chicken types and management practices, and provide baseline data to support targeted parasite control strategies for better poultry health, productivity, and food security in Zanzibar. Methods: The cross-sectional study involved a total of ninety fecal samples (using Cochran sample size formula) that were collected and analyzed using flotation and sedimentation methods. Sampling was conducted once a week for one month. Results: Out of ninety fecal samples, the flotation method identified 65 (72.2%) as negative, with Eimeria *spp.* being the most common parasite identified (12.2%). The sedimentation method proved to be a more efficient diagnostic tool with sensitivity of 83.3% compared to 43.3% for flotation method. Sedimentation method also detected a wider range of parasites. The most prevalent parasite detected by sedimentation was *Ascaridia spp* (17.8%). A statistical analysis confirmed that while the two methods are related (p-value <0.05), they provide distinct and complementary information. Also, the study revealed a high endoparasite prevalence, with 54 out of 90 fecal samples (60%) testing positive. The study also found significant differences in infection rates among the three types of chickens ($p<0.05$). Local chickens had the highest prevalence (24.4%), while layers had the lowest (12.2%). This highlights the vulnerability of local chickens, due to their free-range management system, and underscores the protective benefits of the more controlled environment used for layers. Conclusion and recommendation: The study concluded that local chickens were vulnerable because their free-range system exposes them to parasites in contaminated environments. Sedimentation method proved to be a superior diagnostic tool with higher sensitivity than flotation method and detected a wider range of parasites. It is recommended for public health officials in Zanzibar to create a targeted parasite control program to improve both animal health and food safety.

Keywords

Broilers, Chicken, Layes, Local, Parasitic Diseases, Prevalence

[*]Correspondence: Ali Rashid Rabia (alirrabiaa@yahoo.com)

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1. Introduction

1.1. Background

The poultry sector in Tanzania is undergoing a period of steady expansion, contributing significantly to both meat and egg production for domestic consumption and international markets. This growth is caused by an increasing number of farmers entering the sector and government initiatives designed to incentivize development [12]. Beyond its commercial contributions, poultry farming is fundamental to food security and livelihood support across various African nations, including Tanzania. Approximately 3.7 million households in Tanzania rely on poultry, with indigenous chickens providing 100% of the poultry meat consumed in rural areas, highlighting their critical role in local economies and household nutrition [8, 12]. Commercial broilers and layers are often reared in more controlled, intensive environments, whereas indigenous chickens are managed under traditional free-range systems [8, 11, 12].

In Zanzibar, the chicken industry is particularly dominant, with broilers comprising 87% of the total chicken population. Zanzibar's local poultry production faces challenges from competition with cheaper, imported chicken [4, 7]. Another challenge is the presence of endoparasites, particularly gastrointestinal helminths, which are a major threat to poultry health and productivity globally [2, 8]. They are highly prevalent in the traditional free-range farming systems common in African rural communities [8, 9]. These infections cause significant economic losses through reduced health, decreased egg production, stunted growth, and increased mortality rates [2].

1.2. Identification of Research Gap

While general studies on poultry parasites exist in Tanzania [11], there is a notable research gap concerning comprehensive comparative analyses that specifically investigate the distinct endoparasite profiles across broiler, layer, and local chicken types within the unique socio-economic and environmental context of Zanzibar, particularly at a central market like Darajani. Without such comparative analysis, interventions might be generalized and ineffective. Recognizing that broiler, layer, and local chickens face different parasitic challenges due to their distinct rearing conditions and physiological states allows for the development of tailored health management programs. This study aims to address the identified research gap by determining the prevalence and compares the intensity of endoparasites infections in broiler, layer, and local chickens sampled from Darajani market in Zanzibar. Such programs are essential for the sustainable growth of Zanzibar's poultry sector and for ensuring long-term food security. A nuanced understanding of the parasitic burden in each chicken category is crucial for moving beyond generic control measures to highly specific and impactful interventions.

2. Methods

2.1. Study Design

This was a cross-sectional study designed to determine and compare the prevalence and intensity of endoparasites across three distinct categories of chickens (local, broiler, and layer) available for sale at Darajani Market.

Figure 1. Unguja Island.

2.2. Study Area and Time Duration

The study was done at Darajani Market, a central and major hub for live and dressed poultry in Unguja, Zanzibar. This market serves a sizable portion of the urban and peri-urban population of Zanzibar. Laboratory analyses were performed at the Veterinary Laboratory in Maruhubi, Zanzibar. Darajani market serves as a central and highly active hub for poultry trade in Zanzibar, facilitating the sale of both locally produced and imported chickens. This makes it an exceptionally representative sampling point for assessing the overall health status of chickens available for consumption by the public. The dynamic environment of a bustling market, characterized by high volumes of poultry movement and congregation, may inadvertently contribute to the dissemination and persistence of various poultry diseases, including parasitic infections [4, 7]. The study was conducted during four consecutive weeks of June 2025 encompassing both sample collection and laboratory analysis.

2.3. Sample Size and Sampling Procedure

A total of ninety fecal samples were collected. The target sample size for each chicken category (local, broiler, and layer) was determined by using a Cochran (1977) [5] sample size formula for an unknown population size.).

A minimum required number of sample units (n) is given by:

$$n = \frac{z^2 p(1-p)}{e^2}$$

Where $z = 1.65$ is a z-score obtained from a normal distributed curve corresponding to 90% confidence level, $p = 0.5$ is the proportion or variability among the endoparasites in chicken, $q = 1 - p = 0.5, e = 0.1$ is the precision level. Thus, the minimum sample size is:

$$n = \frac{1.65^2 \times 0.5(1-0.5)}{0.05^2} = 68.06$$

For better approximation n is taken to be 90 as a desirable number formed by three groups of chicken (broilers, local, and layer), each of size 30.

2.4. Sample Collection and Preservation

About 5-10 grams of fresh fecal matter were collected directly from the cloaca using sterile gloves and a spatula, or immediately after natural defecation to minimize environmental contamination. Each sample was placed into a clearly labelled, sterile, airtight container (e.g., universal sample container) and meticulously recorded with the date, time of collection, and the specific chicken category (local, broiler, or layer). Immediately following collection at Darajani Market, each faecal sample was placed into a cool box containing ice packs. This rapid cooling and maintenance of a low temperature (approximately 8℃) were crucial to minimizing the degradation of parasite eggs, oocysts, and larvae, thereby preserving their morphological integrity for subsequent laboratory analysis. All samples were transported to the Veterinary Laboratory at Maruhubi within two to four hours of collection.

2.5. Laboratory Analysis, Data Collection and Analysis

At the Veterinary Laboratory in Maruhubi, Unguja-Zanzibar, each fecal sample underwent processing using concentration techniques, specifically flotation and sedimentation methods, to ensure comprehensive detection of various endoparasite stages. Parasite eggs, oocysts, and larvae were identified based on their characteristic morphological features (size, shape, colour, internal structures) using standard parasitological keys and atlases. Data on the type of chicken (local, broiler, or layer) and the specific endoparasites observed were recorded in a report book at the Central Veterinary Laboratory in Maruhubi. This information was then transferred to a spreadsheet (Microsoft Excel) and analyzed using IBM SPSS Statistics. Descriptive statistics were used to summarize the overall prevalence and intensity of different endoparasites across the three chicken categories [6].

2.6. Ethical Considerations

Ethical approval for the study was obtained from the State University of Zanzibar, Zanzibar Municipality, and Department of Livestock Development-Zanzibar. Formal permission to collect samples was secured from the Darajani Market authorities and individual poultry vendors. All collected samples were managed with strict adherence to biosafety protocols to ensure the safety of personnel and prevent cross-contamination.

3. Results

3.1. Prevalence and Diversity of Endoparasites

Table 1. *Parasite Distribution in Chicken Fecal Samples by Flotation and Sedimentation Methods.*

Name of parasite detected	Flotation method	Sedimentation method
Negative	65 (72.2)	45 (50.0)
Ascaridia spp	7 (7.8)	16 (17.8)
Eimeria spp	11 (12.2)	11 (12.2)
Syngamus trachea	4 (4.4)	5 (5.6)
Isospora spp	3 (3.3)	2 (2.2)
Dispharynx spp	0 (0)	4 (4.4)
Heterakis gallinurum	0 (0)	1 (1.1)
Round worm	0 (0)	3 (3.3)
Capillaria spp	0 (0)	1 (1.1)
Heterakis gallinurum and Ascaridia spp	0 (0)	2 (2.2)
Total samples	90 (100)	90 (100)

The diagnostic methods revealed considerable variation in parasite detection (Table 1). Out of the 90 fecal samples examined, 60% (n = 54) were positive for at least one endoparasite species, while 40% (n = 36) were negative (Table 2). The flotation method identified 25 positive cases (27.8%), with *Eimeria spp.* being the most frequently detected parasite (12.2%), followed by *Ascaridia spp.* (7.8%), *Syngamus trachea* (4.4%), and *Isospora spp.* (3.3%). In contrast, the sedimentation method detected 45 positive cases (50.0%), with *Ascaridia spp.* being the most prevalent (17.8%), followed by *Eimeria spp.* (12.2%) and *Syngamus trachea* (5.6%).

Importantly, the sedimentation method also detected several parasite species not observed by flotation, including *Dispharynx spp.* (4.4%), *Heterakis gallinarum* (1.1%), *Capillaria spp.* (1.1%), and co-infections such as *Heterakis gallinarum* with *Ascaridia spp.* (2.2%). This suggests a broader diagnostic range and greater sensitivity of the sedimentation method.

3.2. Comparison of Diagnostic Methods and Their Statistical Analysis

The flotation method reported a higher number of negative samples (72.2%) compared to sedimentation (50.0%), indicating a lower sensitivity. The sedimentation method not only detected more infections but also revealed a greater diversity of parasites, suggesting its superior diagnostic performance.

Table 2. *Chi-Square Test of Association.*

Pearson chi-square	DF	P-value
52.84	36	0.035

A chi-square test of independence was conducted to determine the relationship between the two diagnostic methods. The test yielded a statistically significant result ($\chi^2 = 52.84$, $df = 36$, $p = 0.035$), indicating that the methods are not independent and differ in their diagnostic capabilities.

Based on results above, a simple method was used to calculate sensitivity and specificity of the two laboratory diagnostic techniques (APPENDIX 1). Sensitivity of Sedimentation method was 83.3% while Flotation method yielded Sensitivity of 43.3%. Specificity was perfect (100%) for both tests.

3.3. Prevalence by Chicken Type

Table 3. *Comparative Prevalence of Endoparasites According to Type of Chicken.*

Chicken type	Counts on week 1,2,3,4 (%)		
	Negative	Positive	Total
Broilers	0,3,5,1=9 (10)	6,3,4,6=21(23.3)	30(33.3)
Locals	2,2,0,4=8 (8.9)	3,7,5,7=22(24.4)	30(33.3)
Layers	6,4,9,0=19(21.1)	3,1,4,3=11(12.2)	30(33.3)
Total	36(40)	54(60)	90(100)

Analysis by chicken type (Table 3) revealed the highest prevalence of endoparasites in local chickens (24.4%), followed closely by broilers (23.3%), with layers showing the lowest prevalence (12.2%). This distribution suggests possible differences in exposure or management practices across chicken types, which may influence susceptibility to parasitic infections (Figure 2). Using one-way ANOVA significant differences ($p<0.05$) in infection rates were also observed among chicken types, suggesting a potential link with management practices. These findings provide critical epidemiological data to inform targeted parasite control strategies aimed at improving poultry health and food safety standards.

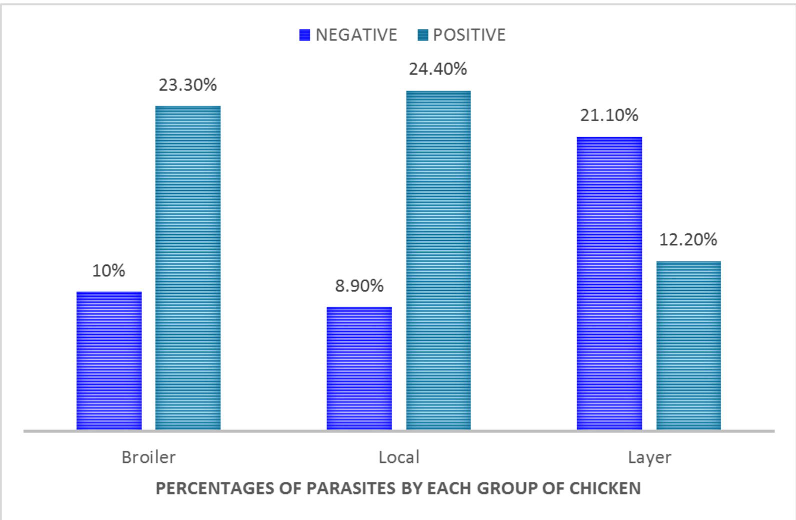

Figure 2. *Comparative Prevalence of Endoparasites According to Type of Chicken.*

4. Discussion

The findings of this study provide a comprehensive comparative analysis of endoparasite prevalence and intensity across broiler, layer, and local chickens at Darajani Market, Zanzibar. The overall prevalence of 60% indicates that endoparasitic infections are a significant health challenge to the poultry supply chain in this region. This is consistent with previous research conducted in Tanzania and other African countries, which has similarly reported high rates of parasitic infections in indigenous and free-range poultry populations [8, 11].

The observed differences in prevalence among the three chicken types—with local chickens and broilers showing significantly higher infection rates than layers—is a key finding of this study. The lowest prevalence in layer chickens (12.2%) is likely attributable to their more controlled and stable housing environments. Layers are typically kept in intensive systems for extended periods, where biosecurity measures, routine deworming, and sanitary practices are often more rigorously applied. These management practices limit their exposure to external sources of infection, such as contaminated soil, intermediate hosts, and wild birds, which are common vectors for endoparasites [2].

In contrast, the high prevalence in local chickens (24.4%) is a direct consequence of their free-range management system. As noted in the literature, village chickens in African rural communities are highly exposed to parasites through contaminated water, feed, and direct contact with soil where parasite eggs can persist for long periods [8, 11]; The high burdens of *Ascaridia spp.* and *Eimeria spp.* in this group are particularly noteworthy, as these parasites are known to cause substantial economic losses through reduced growth, decreased egg production, and increased mortality [3].

The high prevalence in broiler chickens (23.3%) is also a crucial finding, as it contradicts the assumption that their intensive, short-term rearing would protect them from parasitic burdens. This could be a result of several factors. The study's introduction noted that broilers are sometimes held on farms for up to 90 days due to market inefficiencies [1]. This extended rearing period, combined with the high stocking densities characteristic of intensive systems, creates an environment where a single introduction of a parasite can rapidly spread throughout the flock, leading to high infection rates. Furthermore, while the study did not measure intensity, the presence of these parasites in a commercially farmed population suggests that current deworming or management protocols may be inadequate.

The comparative effectiveness of the two diagnostic methods, flotation, and sedimentation is another significant outcome. The results clearly show that the sedimentation method was more sensitive and detected a broader range of parasite species. This is because flotation methods are less effective at detecting heavier parasite eggs, which may sink rather than float [13]. The use of both methods in this study was therefore critical for accurately assessing the true parasitic burden. The statistically significant relationship between the two methods (p-value = 0.035) suggests that while they are related, they provide distinct and complementary information, with sedimentation being the superior method for this type of analysis.

The study’s focus on Darajani Market, a central hub for poultry trade, underscores its importance as a critical intersection for animal health and food safety in Zanzibar [10]. The high prevalence of endoparasites observed here across different chicken types highlights a potential public health concern, as these infections can lead to antibiotic resistance and compromise the nutritional value of meat. These findings provide a data-driven basis for public health interventions and regulatory actions, and a foundation for developing a comprehensive parasite control program for Zanzibar's poultry industry. This research is important in filling a significant gap in the literature and provides actionable data to improve the health and sustainability of Zanzibar’s poultry sector.

5. Conclusion from Results

The study found that local chickens are at higher risk because the free-range production system exposes them to parasites present in contaminated surroundings. It also showed that the sedimentation technique is a more effective diagnostic method than flotation, offering greater sensitivity and identifying a broader variety of parasites.

6. Recommendations

Based on the findings of this research, the following recommendations are made to address the challenges posed by endoparasites infections in the poultry supply chain in Zanzibar:

Implement enhanced biosecurity measures that can prevent the introduction and spread of parasites and contamination from the soil which is major source of parasitic eggs. These measures include footbaths, controlled access to poultry houses, and proper disposal of waste, and use of elevated feeding and watering stations especially for local chicken.

Establish a targeted deworming program by consulting veterinary professionals to select appropriate anthelmintic drugs and to establish a dosage and frequency based on the specific parasites identified.

Improve poultry management practices by educating farmers on the risks associated with keeping broilers for too long, implementing proper sanitation and hygiene practices as well as regularly cleaning and disinfecting poultry houses, equipment, and coops to remove any persistent parasite eggs or larvae.

Abbreviations

ANOVA	Analysis Of Variance
IBM	International Business Machines
SPSS	Statistical Package for the Social Sciences
spp	Species

Author Contributions

Zuhura Suleiman Abdalla: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software Validation, Visualization, Writing – original draft, Writing – review & editing

Rahibu Abdalla Abass: Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software Validation, Visualization, Writing – review & editing, Writing – review & editing

Fatma Mohamed Hamdan: Formal Analysis, Funding acquisition, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – review & editing

Yussuf Abdulrahim Yussuf: Conceptualization, Formal Analysis, Funding acquisition, Methodology, Resources, Validation, Visualization, Writing – review & editing

Ali Rashid Rabia: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

Appendix

Sensitivity and Specificity Analysis

To estimate the sensitivity and specificity of the flotation and sedimentation methods, we can use the overall results as a simplified reference (although ideally, a gold standard would be used). Since 54 of 90 samples were truly positive (Table 2):

Let's assume true positives = 54, true negatives = 36.

Flotation Method:

1. Detected positives: 25
2. Detected negatives: 65
3. True Positives (TP): 25
4. False Negatives (FN): 54 - 25 = 29
5. True Negatives (TN): Assuming flotation correctly identified the 36 true negatives, and the rest are FN → TN = 36
6. False Positives (FP): 65 - 36 = 29 (but this would suggest some false negatives were marked as negatives; hard to confirm without sample-level data).

More conservatively:

1. Sensitivity (Flotation) = TP / (TP + FN) = 25 / (25 + 29) ≈ 46.3%
2. Specificity (Flotation) = TN / (TN + FP) = 36 / (36 + 0) = 100% (assuming no false positives).

Sedimentation Method:

1. Detected positives: 45
2. Detected negatives: 45
3. True Positives (TP): 45
4. False Negatives (FN): 54 - 45 = 9
5. True Negatives (TN): 36
6. False Positives (FP): 45 - 54 = -9 → Not possible; suggests sedimentation detected most true positives, no false positives

So, we estimate:

1. Sensitivity (Sedimentation) = 45 / (45 + 9) ≈ 83.3%
2. Specificity (Sedimentation) = 36 / 36 = 100%

Interpretation: The sedimentation method showed higher sensitivity (83.3%) compared to the flotation method (46.3%), while both methods demonstrated perfect specificity (assuming no false positives). This highlights sedimentation as a more reliable diagnostic tool for detecting endoparasitic infections in poultry.

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