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Ectoparasites and endoparasites of goats in Port Harcourt, Rivers State, Nigeria

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Abstract

Parasitological problems can affect goats' productivity, skin quality and be of zoonotic importance. This study determined the prevalence of ectoparasite and endoparasites in goats in Port Harcourt. A total of 150 animals were examined from four different locations. Ectoparasites were detected by brushing and examining with naked eyes, hand lens, and under the microscope. Endoparasites were detected by standard parasitological technique. Results indicate that ectoparasites were higher (61.3%) in goats than endoparasites (38.6%). Based on location, ectoparasites prevalence was higher in Uniport Agric farm (30.4%), this was followed by Mile 3 with (25.1%) while Rumuosi and Alakahia had 22.8% and 21.6% respectively. Endoparasites were higher (33.2%) at Uniport Agric farm, followed by Mile 3, (24.6%) then Rumuosi and Alakahia had (22.6%) and (19.5%) respectively. Ectoparasites identified were *Caliseta species* (38.1%), *Demodex species* (20.6%), while *Ixodes species*, *Damalimia species*, and *Ctemacephalides species* had (16.9%), (14.0%) and (10.3%). Endoparasites identified were *Nimatodirus* (41.0%), *Trichuris species* (23.8%), *Moneiza species* (22.3%), and *Ascaris species* (12.85). In conclusion, the prevalence of ectoparasites and endoparasites in Port Harcourt is relatively high. An awareness campaign about the importance and control of these parasites is recommended to forestall zoonosis risks.

Keywords: Ectoparasites, endoparasites, small ruminants, Goats, Nigeria

Introduction

Goats were one of the first animals to be domesticated by humans, about 9,000 years ago. They are important contributors to food production in Nigeria. Goats provide meat, milk, fibre, and skin, being second to beef and followed by poultry in terms of contribution to household meat supply by aggregate demand ^[1].

Various parasitological problems may affect a goat's productivity and skin quality. Goat production/rearing is challenged by many parasites such as flies which are primarily a source of a nuisance, especially under confinement conditions that can result in reduced foraging leading to production losses. Other parasites include mites, ticks, and lice which inflict levels of harm due to their intense irritation coupled with the animal scratching and chewing, creating skin lesions for secondary infection. Apart from ectoparasites, there are lots of worms (endoparasites) that are voracious blood-feeders. They inflict such pathological conditions as anaemia, bottle jaw, hypoproteinemia, rough hair coat, anorexia, to mention but a few ^[2].

Many domestic animals have been reported to be more susceptible to many parasites and may harbour different species at a given time ^[3]. Skin glitches caused by lice, keds, ticks, and mange mites result in serious economic loss to small pouch farmers, the tanning industry, and the country as a whole ^[4]. They can result in mortality, decreased production and reproduction, downgrading, and rejection of skins. Bayou stated that skin problems due to external parasites cause 35% of sheepskin and 56% of goatskin rejections ^[5].

Many studies reveal that the West African dwarf goats *Capra hircus*, which are locally reared in Nigeria are exposed to some parasitic arthropods, which include; Ticks, lice, mites, fleas, which are major limitations to efficient goat production in the tropical and temperate regions of the World causing reduced productions ^[6]. Ectoparasites, particularly ticks are very important because of their voracious blood-feeding activities and are vectors for disease agents in both man and livestock, they transmit Chelerosis, Anaplasmosis, and Babesiosis ^[7], ticks are also characterized by severe morbidity and mortality. Endoparasites are the most common cause of diarrhea, weight loss, anemia, poor production, poor reproduction, and ill health in animals ^[8].

They are the most significant medical problem affecting animal health and production throughout the World. The economic losses for producers of animals with uncontrolled endoparasites can be devastating. It results in decreasing growth, and in milk and fibre production, as well as increasing production costs (e.g., labour and drug cost of treatment). Lack of adequate forage (or pasture) or intensive management programs may result in increased animal concentration, which usually results in an increased flock or herd parasitism. The inappropriate use of deworming chemicals further exacerbates and increases the potential severity of flock or herd parasitism^[9].

Considering the importance of these parasites in goat production, and the fact that some of these parasites may even be zoonotic in nature, it is important to monitor/evaluate their prevalence from time to time and raise awareness in case of the red flag. Regrettably, there is a paucity of information on this subject in Rivers State. Therefore, this study aims to determine the prevalence of Ectoparasites and Endoparasites of Goats in some selected abattoirs in Port Harcourt Rivers State, South-South, Nigeria.

Materials and Methods

Study area

The study was conducted in four different locations in Port Harcourt, which include, Alakahia, Rumuosi, Mile 3, and the University of Port Harcourt Agriculture farm of South-South Nigeria located in Rivers State. Port Harcourt is the capital and the largest city in Rivers State, Nigeria. It lies along the Bonny River and is located in Niger Delta. As of 2016, the urban area has an estimated population of 1,865,000 inhabitants, up 1,382,592 with a density of 12, 000 /km² (31,000/sq mi). Here, the climate features a tropical wet climate with lengthy and heavy rainy seasons with very short dry seasons. Port Harcourt's heaviest precipitation occurs during September with an average of 367 mm of rain. December on average is the driest month of the year with an average rainfall of 20 mm. The temperature throughout the year in the city is relatively constant, showing little variation throughout the course of the year. Average temperatures are typically between 25C-28C in the city.

Study Population

This study was carried out by sampling a total of 150 goat breeds in various community locations in Port Harcourt. Places visited include slaughterhouse at mile 3 and Alakahia, goat market at Rumuosi, and Uniport agric animal farm. Studied animals were divided into three groups based on age (0-6months, 7-11months, >11months). Goats were classified according to sex, location, and age (estimated by farmers).

Sampling and Identification of Ecto-parasites of goats

A pre-survey visit was made to identify different goat farms, interact with farmers, and obtain their consent to the study. Consent was obtained through verbal acceptance and letter approval. In the study, interaction with the goat sellers and farmers took place to know the current health status of goats and the attitude and responsibility contributed by farmers towards their goats to improve yield and fecundity, appointment for sample collection was negotiated. The farmers were of assistance during the collection of samples by restraining the goats. Sample collection was carried out between June, July, and August 2019.

The goats were examined visually for ectoparasites infestation

on different body regions, closely inspecting the study animal after restraining, brushing with a fine-toothed brush to capture fleas (brushing was made onto a white cardboard paper), handpicking, picking aided with forceps (to retain mouthparts of ticks and avoid spilling the gut content). Each ectoparasite obtained from goats is stored in 70% alcohol for preservation. Examination of ectoparasites on goats was by age and sex, each ecto-parasite from goats was collected and transferred immediately into a clearly labelled separate specimen plate containing 70% alcohol for preservation, all samples obtained were moved to the laboratory (Animal and Environmental Biology laboratory) for proper identification. Using the key provided by Domestic Animal Guide Africa^[10], ticks classification was carried out based on the morphology and the structure of the tick species. All fleas, lice, and ticks (nymph) were focused at $\times 2$, counted and identified at $\times 4$ with the aid of a dissecting microscope; hair samples were also thoroughly examined under the dissecting microscope for mites.

Identification of Endo-parasites of goats

Goats are of local breed, type of management is the traditional one. During the day the goats' flock are herded on grazing pasture together. Data on the goat management and health was collected from each region, through direct questions and answers. Faecal samples were examined during this study and the following techniques were adopted.

The Wills Technique:

This technique was described by Soulsby^[11] as follows:

Two grams of faeces were transferred to a mortar and mixed with saturated sodium chloride solution. The mixture stirred gently until the faeces were thoroughly suspended, it was then poured through a tea strainer into a container and gently pressed the excess fluid from the debris remaining in the strainer. The mixture was immediately poured into the test tube until it produced a convex meniscus. Then it was centrifuged thrice, the first with 10% formal saline, the second same procedure, and the third with 10% formal saline and fuel. This was done in order to remove the debris and then decant to get the debris. The deposit was then added 3-5 drops of formal saline and a drop of lugol's iodine and mixed properly. A drop of the mixture was then placed on a clean glass slide and a coverslip was applied to the slide, which was then examined microscopically for parasite eggs.

The identification of eggs and oocysts was achieved according to Soulsby^[11] and Thienpont *et al.*,^[12].

Statistical Analysis

Descriptive statistical tools such as percentages, mean, simple charts, and chi-square test were used to analyse the data generated for the study.

Results

The overall prevalence of parasites (Ecto and Endo) on/in goats in the study is shown in Table 1. Out of a total of 150 goats which comprises, 37 from Alakahia 37 from Rumuosi, 37 from Mile 3 and 39 from Uniport Agric farm examined, 407 (61.3%) parasites encountered in all locations were ectoparasites while 256 (38.6%) parasites seen in all locations were endoparasites. Among the ectoparasites, Uniport Agric Farm has the highest number 124 (30.4%), this was followed by Mile 3 with 102 (25.1%) while Rumuosi and Alakahia have 93 (22.8%) and 88(21.6%) respectively. Also, among the

endoparasites, Uniport Agric farm has the highest number, 85(33.2%), this was also followed by Mile 3, with 63 (24.6%) while Rumuosi and Alakahia have 58(22.6%) and 50 (19.5%) respectively. There were more ectoparasites than endoparasites in the study. More so, there were more parasites on Uniport Agric farm than in other locations.

The ectoparasites species infestation on the sampled goats is presented in Table 2. *Caliseta spp* had the highest occurrence (38.1%), followed by *Demodex spp* (20.6%) while *Ixodex spp*, *Damalimia spp.*, and *Ctenocephalides spp.* had (16.9%), (14.0%) and (10.3%) respectively. Table 3 shows the endoparasites species infestation on the sampled goats: *Nematodirus spp* had the highest occurrence, (41.0%), while *Trichuris spp.*, *Moniezia spp.*, and *Ascaris spp.* had (23.8%), (22.3%) and (12.8%) respectively.

Table 1: Prevalence of ectoparasites and endoparasites on/in goats in Port Harcourt and Environs.

| Study area | No. of goats examined | No. of parasite | Ectoparasites | | | | | No. of parasites | | | | Total |
|------------|-----------------------|-----------------|---------------|--------|--------|----------|-----------|------------------|--------|--------|--------|-----------|
| | | | Endoparasites | | | | | | | | | |
| | | | C. spp. | D. spp | I. spp | Da. spp. | Ct. spp. | Total | N. Spp | M. spp | T. spp | |
| Alakahia | 37 | 38 | 19 | 15 | 9 | 7 | 88(21.6) | 23 | 10 | 12 | 5 | 50(19.5) |
| Rumuosi | 37 | 38 | 20 | 16 | 12 | 7 | 93(22.8) | 26 | 10 | 14 | 8 | 58(22.6) |
| Mile 3 | 37 | 38 | 21 | 18 | 15 | 10 | 102(25.1) | 26 | 14 | 15 | 8 | 63(24.6) |
| Uniport | 39 | 41 | 24 | 20 | 21 | 18 | 124(30.4) | 30 | 23 | 20 | 12 | 85(33.2) |
| Total | 150 | 155 | 84 | 69 | 57 | 42 | 407(61.3) | 105 | 57 | 61 | 33 | 256(38.6) |

C. spp = *Culiseta* species, D. spp = *Demodex* species, I. spp = *Ixodex* species, Da. spp = *Damalimia* species, Ct. spp = *Ctenocephalides* species, N. spp = *Nematodirus* species, M. spp = *Moniezia* species, T. spp = *Trichuris* species, A. spp = *Ascaris* species

Table 2: Ectoparasites species infestation on the sampled goats in PH and Environs. (n=150).

| Species of Ectoparasite | No. of goat infected | No. of parasites | % infestation |
|----------------------------|----------------------|------------------|---------------|
| <i>Culiseta spp</i> | 46 | 155 | 38.1 |
| <i>Demodex spp.</i> | 33 | 84 | 20.6 |
| <i>Ixodex spp.</i> | 27 | 69 | 16.9 |
| <i>Damalimia spp.</i> | 23 | 57 | 14.0 |
| <i>Ctenocephalides spp</i> | 21 | 42 | 10.3 |
| Total | 150 | 406 | 99.9 |

Table 3: Endoparasite species infection on the sampled goats in PH and Environs (n=150)

| Species of Endoparasite | No. of goat infected | No. of parasites | % infection |
|-------------------------|----------------------|------------------|-------------|
| <i>Nematodirus spp.</i> | 50 | 105 | 41.0 |
| <i>Meaiezia spp.</i> | 43 | 57 | 22.3 |
| <i>Trichurisspp.</i> | 35 | 61 | 23.8 |
| <i>Ascaris spp.</i> | 22 | 33 | 12.8 |
| Total | 150 | 406 | 99.9 |

Table 4: Age related ectoparasites in the examined goats: (n=150)

| Age of goat | No. examined | No. of parasites | % infection |
|-------------|--------------|------------------|-------------|
| 0-6 months | 25 | 87 | 21.8 |
| 7-11 months | 50 | 106 | 26.0 |
| >11months | 75 | 214 | 52.6 |
| Total | 150 | 406 | 99.9 |

Table 5: Age related endoparasites in the examined goats in PH and Environs (n = 150).

| Age of goat | No. examined | No. of parasites | % infection |
|-------------|--------------|------------------|-------------|
| 0-6months | 25 | 55 | 21.5 |
| 7-11months | 50 | 87 | 33.9 |
| >11months | 75 | 164 | 44.5 |
| Total | 150 | 406 | 99.9 |

Age-related ectoparasites in the examined goats (Table 4) shows that the ectoparasites infestation cut across all the ages of the goats examined, with the highest infestation among >11 months (52.6%) followed by 7-11months (26.0%) and the least among 0-6months (21.3%). Table 5 shows the age-related endoparasites in the examined goats: The endoparasites infection though found in all the age groups but was more between >11months (44.5%) and 7-11months (33.9%) while the least was among 0-6months (21.5%).

Sex-related ectoparasites in the examined goats (Table 6) show that the ectoparasites infestation was more in female goats (70.5%) than the male goats (29.4%). Also, the endoparasites infection (Table 7) was more in the female goats (61.7%) than in the male goats (38.2%).

Table 6: Sex related ectoparasites in the examined goats in PH and Environs. (n =150)

| Sex | No. examined | No. of parasites | % infection |
|--------|--------------|------------------|-------------|
| Male | 65 | 120 | 29.4 |
| Female | 85 | 287 | 70.5 |
| Total | 150 | 406 | 99.9 |

Table 7: Sex related endoparasites in the examined goats in PH and Environs. (n = 150)

| Sex | No. examined | No. of parasites | % infection |
|--------|--------------|------------------|-------------|
| Male | 65 | 98 | 38.2 |
| Female | 85 | 158 | 61.7 |
| Total | 150 | 406 | 99.9 |

Discussion

The overall prevalence of ectoparasites and endoparasites in this study were (61.3%) and (38.6%) respectively. This is relatively high and suggests that the agro-ecological and geo-climatic conditions of Port Harcourt favour the growth and multiplication of these parasites. The 61.3% of the ectoparasite is particularly high when compared to the 10.0% reported in Gwalagwada^[13] and 45.5% reported in Ethiopia^[14] but in agreement with Omudu and Amuta^[15]. This high prevalence could be attributed to ignorance, poor husbandry, and poor awareness on the part of the goat sellers and farmers, and possible health status of the goats such as malnutrition. A similar observation was made by Williams and Payne^[6] who specified that high prevalence could also be attributed to illiteracy on the side of the goat keepers and their avoidance tendency of preventive measures.

The 38.6% recorded for the endoparasites is in agreement with the prevalence estimated (31.0–40.0%) in Nigeria^[16] and in Zimbabwe^[17] and lower than 51.46% recorded in Abeokuta^[18]. The low prevalence may be associated with the types of feeds used which are mainly plant leaves and could

contain ananain and papain that have anthelmintic activity as many leaves do and these have been shown to reduce parasitic infections^[19].

The preponderance of ectoparasite was higher compared to the endoparasites in this study. This may not be unconnected to the unhygienic conditions of their pens where these parasites could hide within crevices and loads of wastes on the floor where they can thrive.

Location-based infection and infestation show that Uniport agric farm goats were more infected and infested. The animals from the farm have some grazing areas and therefore are allowed to move from place to place compared to the ones from Rumuosi, Alakahia, and Mile I markets and so the possibility of contacting parasites from where grasses have an accumulation of parasites^[20].

Five ectoparasites species reported in this study, *Cutiseta spp*, *Demodex spp*, *Ixodex spp*, *Damalinia spp*, and *Ctenocephalides spp*. were among parasites reported by previous researchers^[13, 15]. The four (4) endoparasites species reported in this study, *Nematodirus spp*, *Moniezia spp*, *Trichuris spp.*, and *Ascaris spp*. were also among endoparasites reported by other researchers. The tropical climate of Port Harcourt could be another reason for the thriving parasites and therefore explain the reason for the different species encountered in this study although similar species have been encountered in other parts of Nigeria^[13, 18].

Age-related ectoparasites and Endoparasites infestation and infection show that goats > 11months had a higher preponderance than those within the lower age range. This finding is at variance with some researchers^[13, 21] and Dey *et al.*,^[22] who observed that the younger animals are more susceptible to nematodes in pastures than adults because they are immunologically naïve and less capable of preventing parasite establishment and was comparatively more prone to parasitic infection than adults.

The finding that female goats were more susceptible than males as indicated by the results were similar to the findings by Tarig *et al.*,^[23] who attributed this to the genetic predisposition and differential susceptibility owing to hormonal control. However, it is at variance with the findings of Idris and Umar^[13] who recorded higher prevalence in males than in females.

In conclusion, the prevalence of ectoparasites and endoparasites in Port Harcourt is relatively high. An awareness campaign about the importance and control of these parasites is recommended to forestall the risks of zoonosis.

Conflicts of interests

The authors declare that there is no competing interest.

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