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Prevalence and Identification of Ectoparasites on Ruminant Animals Reared in Biu Local Government Borno State, Nigeria

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ABSTRACT

Ectoprasites have been noted as the main factor that reduces the animal's production in the tropics. The aim of this study is to provide a database by determine the prevalence and identifying the species of ectoparasites on ruminant animals reared in Biu Local Government, Borno State, Nigeria. A total of 420 animals were examined which include 170 goats, 100 sheep and 150 cattle. Goats had the highest prevalence of 33% followed by cattle and sheep with 26.7% and 18% respectively. The different in prevalence rate between the species were not statistically significant. Female goat, sheep and cattle have the highest prevalence rate of 32(37.2%), 10(20%) and 26(34%) than male counterparts with 24(28.6%), 8(16%) and 14(19%) respectively. The different of prevalence rate between sexes of the animal were all statistically significant. Buratai and Tum had the highest of 20 (40%) each followed by Biu with the least of 16 (22.8%) in Goat while on sheep Tum has the highest prevalence of 7(23.3%) followed by Buratai and Biu with 5(16.7%) and 6(15%) respectively. However, on cattle Buratai has the highest prevalence of 16(33.3%) followed by Tum and Biu with 12(25%) and 12(22.2%) respectively. The different in prevalence rate in different locations in all species were statistically not significant. The result shows tick species *Amblyomma variegahum* has highest prevalence of 70(21.7%) followed by *Boophilus annulatus, Hyalomma trancatum, Boophilus geigy, Rhipicephalis species, Hyalomma rufipes* and *Amblyomma splendidum* with 53(16.5%), 40(12.4%), 29(9%), 27(8.4%) and 27(8.4%) and lice species *Linognathus vituli, Haematopinus bovis, Solenopotes capillatus* with 39(12.1%), 11(3.4%) and 9(2.5%) respectively. This investigation gives baseline information on the level and species of ectoparasites in the study area. Therefore, appropriate control measures need to be taken to reduce the prevalence rate to the minimal level and improve the health status of their animals which will maximize their profit.

Keyword: Animal, Biu, Ectoparasite, Prevalence, Ruminant

INTRODUCTION

Ectoparasites, particularly ticks, significantly impact domestic animals by directly causing poor health and reducing production through various parasitic mechanisms. Moreover, they act as vectors transmitting a variety of viruses, bacteria, and protozoa among domestic animals. The detrimental effects of these parasites are particularly pronounced in resource-poor farming communities in developing countries, such as sub-Saharan Africa, Asia, and Latin America, where there is a rapid increase in the demand for livestock products (Perry *et al*., 2002; Delgado, 1999).

Various factors influence the distribution of ectoparasites among hosts, including the season and the mode of livestock rearing (James-Rugu and Iwuala, 1995; James-Rugu and Iwuala, 2002). In Nigeria, parasites pose a significant constraint to livestock production, especially ruminant animals (Fabiyi, 2007). The health status of ruminant animals plays a pivotal role in their productivity within a semi-intensive rearing system, where animals

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graze and some are supplemented with concentrate or prepared for sale. This type of rearing system exposes animals to various parasites and health issues, making effective control of parasitic diseases crucial but also costly (Lamorde, 1981).

Controlling ectoparasites is particularly challenging, and farmers need an understanding of infestation for effective management (Hassan, 1997). The economic impact of ticks on both individuals and national economies emphasizes the need for prioritized tick control strategies (Basil, 2005). Understanding the prevalence and species involved in transmission is crucial for the control of tick-borne diseases (Gholan *et al.,* 2007).

There is limited available data on the overall prevalence of ectoparasites in the Study Area. The study aims to determine the prevalence and identify the species of ectoparasites on ruminant animals reared Biu Local Government, Borno State, Nigeria. This will serve as database and be useful knowledge that can be used in formulating effective control strategies for the ectoparasitic infections, steering toward a significant development in the animal productivity in the area.

MATERIALS AND METHODS

Study Area

The study was conducted in the Biu Local Government Area of Borno State from August to October 2023. Biu Local Government stands as one of the largest towns in Borno South Senatorial Zone, Nigeria, positioned between latitude 10° 36'40" N, 12°11'42" E, and longitude 10.611 ^{0}N, 12.195^{0}E. Situated on the Biu plateau, the local government area boasts an average elevation of 626 meters above sea level (Britannica, 2009). Falling within the Northern Guinea savannah and the Sudan savannah regions, the area experiences a semi-arid climate with an average temperature of 32°C. The local government area features two distinct seasons, the dry and rainy seasons, covering a landmass of about 3,423 km2. According to the 2006 census, the total human population in the area is 175,760. Biu, located 172 km from Maiduguri, the state capital, serves as the administrative headquarters of the local government. Other developed areas attached to the local government include Buratai, Garubula, Miringa, Madara-Girau, Yawi, and Gunda, among others. The town is home to various tribes, with the most populous being the Babur (Pabir) tribe. Agriculture plays a pivotal role in the local economy, encompassing both farming and animal rearing activities (Amaza *et al.,* 2007).

Sample Size Determination

The minimum sample size was determined using the statistical formula of Fisher for calculating sample size as described by (Jung, 2014).The formula is

$$N = Z^2 p (1 - p)/d^2$$

where

N= sample size

Z= is normal deviant at the desired confidence interval. Here, it will be taken at the portion of 95% confidence

interval = 1.96

P= proportion of population with desired characteristic, since the proportion of the population is not known, then 50% will be used.

d= is margin of error acceptable 0.05.

Using this formula

N = (1.96)2 *0.5(1-0.5)/0.052=384 students

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Sampling Techniques

A random sampling technique was employed to select three (3) sides within the study area for the collection of samples. Each week thirty five 35 ruminant animals were selected and examined for sample collection for a period of 12 weeks from August-October, 2023. A total of four hundred and twenty ruminant animals were examined for the purpose of this research.

Sample Collection

Random sampling technique was used to select 420 ruminant animals for the collection of ectoparasites from the selected locations in the study area. Ectoparasites were collected using a forceps to detach them from their host. All parts of the animal body were carefully examined. All the parasites collected were stored in a container containing 70% ethanol and 5% glycerin for later identification in the laboratory. The containers were labeled based on the location, breed and sex of the animal. The samples collected were then transported to Biology Laboratory Faculty of Natural and Applied Sciences, Nigerian Army University Biu for identification.

Laboratory Identification

Identification of parasites was carried out in the laboratory by placing collected parasites in a petri-dishes and viewed using hand lens and microscope. The descriptive keys of Wall and Shearer (1997) and Walker *et al.,* (2003) were used for identification of the parasite collected. The number of each species of the parasite on each ruminant animal were carefully counted and recorded.

Data Analysis

The prevalence of ectoparasites was determined using simple percentages, and the chi-square test for any significant differences on the incidence of ectoparasite infestation on different locations, breeds and sexes of the animals at $p< 0.05$ level of significance.

RESULTS

The result of this study revealed an overall prevalence of 114(27.1%). Goat has the highest prevalence of 56(33%) followed by cattle and sheep with 40(26.7%) and 18(18%), respectively. The different in prevalence between different species of the animal in the study area were not statistically significant (Table 1).

Table 1: Ectoparasite Infestation on Ruminant Animal Based on Species

Breed	Number Examined	Number Effected (%)	Degree of Freedom	Significance Value	Decision
Goat	170	56(33)	2	0.78	Not significant
Sheep	100	18(18)			
Cattle	150	40(26.7)			
Total	**420**	**114(27.1)**			

The prevalence based on sexes of the animal showed female goat, sheep and cattle has the highest prevalence rate of 32(37.2%), 10(20%) and 26(34%) than male counterparts with 24(28.6%), 8(16%) and 14(19%), respectively. The different of prevalence rate between different sexes of the animal were all statistically significant (Table 2).

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Table 2: Ectoparasites Infestation on Ruminant Animal Based on Animal's Sex in the Study Area

Parameter	Number Examined	Number Effected (%)	Degree of Freedom	Significance Value	Decision
Goat					
Male	84	24(28.6)	1	1.44	Significant
Female	86	32(37.2)			
Sub- Total	**170**	**56(33)**			
Sheep					
Male	50	8(16)	1	0.27	Significant
Female	50	10(20)			
Sub- Total	**100**	**18(18)**			
Cattle					
Male	74	14(19)	1	4.48	Significant
Female	76	26(34)			
Sub- Total	**150**	**40(26.7)**			
Total	**420**	**114(27.1)**			

Prevalence based on the location and species of the animal showed Buratai and Tum have the highest of 20(40%) each and Biu has the least of 16(22.8%) in Goat. On sheep, Tum has the highest prevalence rate of 7(23.3%) followed by Buratai and Biu with 5(16.7%) and 6(15%), respectively. However, on cattle Buratai has the highest prevalence of 16(33.3%) followed by Tum and Biu with 12(25%) and 12(22.2%), respectively. The different in prevalence rate between different locations in all species were statistically not significant (Table 3).

Table 3: Ectoparasite Infestation on Ruminant Animal Based on Species and Location

Species/Location	Number Examined	Number Effected (%)	Degree of Freedom	Significance Value	Decision
Goat					
Biu Town	70	16(22.8)	2	1.06	Not significant
Buratai	50	20(40)			
Tum	50	20(40)			
Sub- Total	**170**	**56(33)**			
Sheep					
Biu Town	40	6(15)	2	0.04	Not significant
Buratai	30	5(16.7)			
Tum	30	7(23.3)			
Sub- Total	**100**	**18(18)**			
Cattle					
Biu Town	54	12(22.2)	2	0.15	Not significant
Buratai	48	16(33.3)			
Tum	48	12(25)			
Sub- Total	**150**	**40(26.7)**			
Total	**420**	**114(27.1)**			

The findings in this study showed that tick species of *Amblyomma variegahum* have highest prevalence of 70(21.7%) followed by *Boophilus annulatus, Hyalomma trancatum, Boophilus geigy, Rhipicephalis species, Hyalomma rufipes* and *Amblyomma splendidum*with 53(16.5%), 40(12.4%), 29(9%), 27(8.4%) and 27 (8.4%) and lice

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species *Linognathus vituli, Haematopinus bovis, Solenopotes capillatus* with 39 (12.1%), 11(3.4%) and 9 (2.5%), respectively (Table 4).

Table 4: Species and Abundance of Ectoparasite Species Collected during the Study

Parasite/Species	Frequency	Prevalence (%)
Tick		
Amblyomma variegahum	70	21.7
Boophilus annulatus	53	16.5
Hyalomma trancatum	40	12.4
Boophilus geigy	29	9
Rhipicephalis species	27	8.4
Hyalomma rufipes	27	8.4
Amblyomma splendidum	18	5.6
Lice		
Linognathus vituli	39	12.1
Haematopinus bovis	11	3.4
Solenopotes capillatus	8	2.5
Total	**322**	**100**

DISCUSSION

Ectoprasites have been noted as one of the main factors which causes great economic looses to the livestock farmers in the world, because of its adverse effect on their hosts. The findings of this study revealed an overall prevalence of 27.1% in the study area. The result is slightly higher than that of Adang (2015) and Orpin, (2020) who reported 16.7% and 18.39% in sheep and goats in Gombe and Katsina respectively. The different may be due to the geographical location, rearing management system and possibly lack of awareness among farmers in the area. Goats had the highest prevalence rate of 33% followed by cattle and sheep with 26.7% and 18% respectively, but the different between the various species of animals was not statistically significant. This disagreed with the report of Tongjura *et al.,* (2012) who reported higher prevalence on cattle than sheep and goat in Nasarawa state. Naturally goats are known to graze less and within their compound compared to sheep and cattle that are grazing much and far away into the bushes hence come in contact with more vegetation and subsequently more ectoparasites. But in this area they are practicing a combine rearing system of rearing animal which make all the species to have equal chance of been infected with the parasites. James-Rugu and Iwuala (2002) recorded high infestation rate of 63.2% on adult animals and attributed this to contact due to their large body size and feeding on vegetation on which the ticks were attached.

Female of all breeds were found to have high ectoparasite infestation when compared with the male counterpart. This agreed with the earlier report of Obi *et al.,* (2014) who reported high prevalence in female sheep and goat than male in Anambra state and Omudu *et al.,* (2007) and Wahab and Okunlola (2021) that reported higher prevalence in female cattle than male in Makurdi and Oyo town respectively. The female are usually kept for years for breeding purpose especially the one that give birth to twin, triplets or sometime quadruplets at a time and there are less expensive. Because of that they are more exposed to variety of parasites than male counterpart. The male are more expensive therefore, special care used to be given. During the dry season the female move from place to another searching for food while the male are keep at home for pertaining especially sheep (Ram) and cattle (Bull). This

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results disagrees with reports by Hitcheock, (1993) who reported that males are more infested with ticks than female cattle, because most of the males in the tropics are mainly used for most of the farming activities and moved from place to place in search of food and in the process get infested with ticks, while the females are mainly confined for breeding purposes and therefore are less exposed to tick infestations in the tropics.

Prevalence based on the location and species of the animal showed Buratai and Tum have the highest of 20(40%) each followed by Biu metropolis with the least of 16(22.8%) in Goat, and sheep has the highest prevalence of 7(23.3%) followed by Buratai and Biu with 5(16.7%) in and 6(15%) in Tum respectively. However, in cattle Buratai has the highest prevalence of 16(33.3%) followed by 12(25%) and 12(22.2%) respectively. The different in prevalence rate between different locations in all species were statistically not significant. The different in prevalence in different locations may be due to the rearing method and other environmental factors where the tick and other ectoparasites thrive readily found and also it may attribute to more awareness in urban areas than rural as reported by Usman and Malann, (2019).

The findings in this study showed that tick species of *Amblyomma variegahum* have highest prevalence of 70(21.7%) followed by *Boophilus annulatus, Hyalomma trancatum, Boophilus geigy, Rhipicephalis species, Hyalomma rufipes* and *Amblyomma splendidum*with 53(16.5%), 40(12.4%), 29(9%), 27(8.4%) and 27(8.4%) and lice species *Linognathus vituli, Haematopinus bovis, Solenopotes capillatus* with 39(12.1%), 11(3.4%) and 9(2.5%) respectively. All these species have been reported with different prevalence rate in many part of the country such in Bauchi, Makurdi and Abuja by Ofukwu*et al.,* (2008); Malann *et al.,* (2016) and Usman and Malann, (2019) respectively. The different in prevalence rate of the species may be due the difference in the geographical location and rearing system. The highest abundance of *Amblyomma* species recorded for both species of animals in this research was not unexpected because it has been established in literature that it is the most important species of the African continent, being adapted to domestic livestock and widespread throughout tropical and sub-Saharan Africa (Obadiah *et al*., 2017).

In conclusion, the result of the study indicates that goat has the highest prevalence of 56(33%) followed by cattle and sheep with 40(26.7%) and 18(18%) respectively. The different in prevalence between different species of the animal in the study area were not statistically significant. This study gives baseline information on the level and prevalence of each species of ectoparasites in the area. Therefore, appropriate control measures such as improve sanitary conditions, adequate nutrition, proper housing as well as educating the farmers on the effects of these ectoparasites on their animals and their welfare. This will reduce the prevalence rate to the minimal level and improve the health status of their animals which will maximize their profit.

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