PREVALENCE OF HARD AND SOFT TICKS AMONG YOUNG AND ADULT CATTLE IN A RESEARCH FARM

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ABSTRACT
Ticks attach to the skin of cattle and feed on their blood, causing direct damage and transmitting diseases with resultant economic losses. Understanding the tick type that affect cattle predominantly necessitate this study in order to know how best to minimize economic losses resulting from various tick infestation. This study investigated the prevelance of hard tick and soft tick infestation in cttle in the teaching and research farm of the federal university of technology, minna, Nigeria using a stratified random sampling procedure in a cohort. The study also evaluated tick infestation in both adult and young cattle on the farm. A total of 53 cattle were evaluated for tick infestation over a four-week period and ticks were identified using standard protocol. Data collected were analyse using descriptive statistics and t-test. The result shows that hard ticks were significantly most prevalent in cattle ($p<0.05$) with *Amblyoma* being the most prevalent spp (54%). adult cattle were most significantly infested ($p<0.05$). the study concluded that hard ticks affect cattle more than soft ticks and adult cattle were most infested. It was recommended that emphasis should be more towards ctrolling hard ticks with emphasis on diseases they transmit.
Key words: Cattle, Hard tick, Soft tick, Disease

INTRODUCTION
Ruminant livestock, particularly cattle, play a critical role in Agribusiness and food security. They serve as primary source of meat, milk, leather, organic manure and source of livelihood. In many parts of the world, cattle farming serves as source of empowerment for rural and periurban communities (FAO, 2018). Cattle farming is central to trade, employment, and forms an integral part of Fulani culture where it is an index of wealth. However, cattle farming is threatened by diseases such as trypanosomiasis, babesiosis, anaplasmosis among other diseases which are commonly transmitted by parasites such as ticks. Ticks, are a major parasite of economic importance in cattle farming because of their direct and indirect impacts on health of cattle which could lead to death of the cattle if not controlled (Jongejan & Uilenberg, 2004). Tick control measures is related to risks associated with tick infestation in cattle farming and the indirect losses due to reduced animal performance and deaths caused by tick-borne diseases. (Walker *et al.,* 2003). It is estimated that tick-borne diseases cost the global livestock industry billions of dollars annually due to veterinary expenses, reduced productivity, and mortality (de Castro, 1997). Identification of a tick type plays a role in the choice and effectiveness of tick control measures. It also reduces the risk of the ticks developing resistance to acaricides (Abbas *et al.,* 2014).

Tick types

Ticks are blood-feeding arachnids that attach to the skin of cattle and feed on their blood, causing direct damage and transmitting diseases. Ticks can be divided into two main families: hard ticks (Ixodidae) and soft ticks (Argasidae). Hard ticks, such as *Rhipicephalus (Boophilus) microplus* and *Amblyomma* species, are more common in cattle and are known vectors for diseases like babesiosis and anaplasmosis (Jongejan & Uilenberg, 2004). Ticks generally attach to areas with thin skin, such as the ears, neck, and underbelly, and can cause substantial irritation and blood loss in addition to transmitting pathogens.

Tick control

A comprehensive understanding of the specific tick species in a given environment, their life cycles, and their interactions with both the host and the surrounding ecosystem is crucial for effective control and management of ticks. This is essential because different species of ticks have varying capacities to transmit diseases and can exhibit distinct behavioral patterns that influence their control especially in the choice of acaricide application. *Rhipicephalus (Boophilus) microplus)*, a one-host tick, is notorious for transmitting bovine *babesiosis*, while *Amblyomma* species are known vectors of heart water, a disease caused by *Ehrlichia ruminantium* (Jongejan & Uilenberg, 2004).

Significant impact of ticks on cattle farming underpins the need to study the types of ticks affecting cattle in the teaching and research farm so as to understand the best way to control them. There is often a lack of comprehensive studies focusing on the identification and characterization of tick species in specific settings, such as teaching and research farms. Most studies tend to focus on commercial or large-scale farming operations, neglecting the unique challenges faced by educational institutions. A detailed understanding of the tick species on these farms, coupled with insights into their prevalence, distribution, and resistance patterns, is necessary for implementing effective control measures that protect animal health and enhance research quality. The aim of this study is to identify and characterize the tick species affecting cattle on the teaching and research farm in Federal University of Technology, Minna, Gidan Kwano Campus, with the goal of informing and improving management strategies for tick control. To achieve this aim, the project will determine the prevalence and distribution of tick species infesting cattle on the farm.

MATERIALS AND METHODS

Study Area

The study was conducted at the Teaching and Research Farm of Federal University of Technology Minna, Gidan Kwano Campus, Niger State. Geographically located within latitude 09°31’ 18.2’’N and longitude 6° 27’ 40 ‘E with an elevation ranging from 230-250 m. The study area lies within the Southern guinea savanna of Nigeria. The location’s climate is sub humid having a mean annual rainfall of 1338mm, dry season of about 5 months and mean temperature of about 30°C (Post Graduate School Prospectus, Federal University of Technology, Minna, 2012).

Study Design

A cross-sectional study design (transverse study in a cohort) was employed. The study was conducted over a period of 4 weeks, during which animals were systematically examined for the presence of ticks.

Sampling Procedures

A stratified random sampling method was employed to select cattle for this study, ensuring that the sample represented the diversity within the herd in terms of age (adult and young). The farm's cattle population consisted of 53 cattle, including both local and cross-breed cattle, reared under a semi-intensive system. Ticks were collected from the selected cattle using manual method. The collection process was performed early in the morning when ticks are more likely to be attached to the host due to feeding habits. A systematic approach was used to ensure that ticks were collected from all parts of the animal, focusing on areas where ticks typically attach, such as the ears, neck, abdomen, and under the tail.

Tick Identification Techniques

Visual Inspection, Morphological Examination using Walker *et al*. (2003) and Estrada-Peña *et al.* (2010) were used to ensure accurate identification of the tick species under the guide of an entomologist from the department of Animal Biology of the university.

Data Analysis

Data were analyzed using descriptive statistics. T-test was used to compare mean tick infestation levels between young and adult cattle; hard tick and soft tick at $p < 0.05$. Effect sizes were calculated using Eta squared to assess the magnitude of differences. Analyses were performed using Microsoft Excel and statistical Package for Social Scientist software (SPSS 16.0)

RESULTS

The result in Table 1 shows mean tick infestation for T1 was 5.50 (± 1.29), indicating a higher hard tick infestation compared to T2 which affirms the reports of Jongejan & Uilenberg (2004) which stated that hard ticks affect cattle predominantly more than soft ticks and the mean result of 3.50 (± 0.57) at $P<0.05$, suggesting a statistically significant difference between the two types of ticks. The result was further subjected to Eta (n^2) with a value of 0.65 indicating a large effect size. Based on the mean value obtained, the result indicates that T1 (hard tick) had a large difference when compared to T2. (soft tick)

Table 1 Prevalence of Hard and Soft Tick in Teaching and Research Farm

Parameter	Treatment	Mean	Standard Deviation	P-Value	Eta-Value	Partial eta-value
TICK	T1	5.50	1.29	0.03	0.81	0.65
	T2	3.50	0.57			

T1= Hard Tick

T2= Soft Tick

The prevalence of tick infestation in the cattle population was assessed in terms of the percentage of animals affected as shown in Figure 1

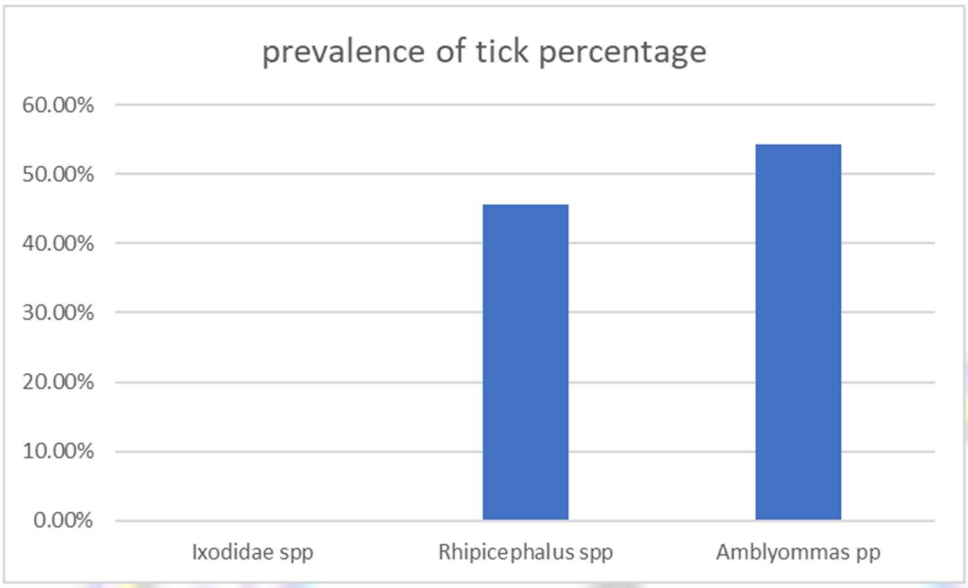

Figure 1: Prevalence of tick specie infestation in cattle on teaching and research farm

This result shows that 54% of the ticks was *Amblyommas spp* indicating the highest prevalence, followed by *Rhipicephalus spp* having 46% showing significantly higher prevalence and then *Ixodidae spp* having the lowest percentage.

The mean tick infestation presented in Table 2 shows that tick inf estation for T1 (adult cattle) was 6.25 (± 2.06), indicating a higher infestation rate compared to T2 (young cattle), which had a mean infestation of 2.25 (± 1.29). The P -value for the comparison between T1 and T2 is $P<0.05$, suggesting a statistically significant difference in tick infestation between adult and young cattle groups. The Eta (n^2) of 0.73 indicates a large effect size, showing that age has a significant impact on infestation levels. Based on the mean value obtained, the result shows that T1 had a large difference when compared to T2.

Table 2 Characterization of Tick between Adult Cattle and Young Cattle

Parameter	Treatment	Mean	Standard Deviation	P-Value	Eta-Value	Partial eta-value
Cattle	T1	6.25	2.06	0.02	0.86	0.73
	T2	2.25	1.29			

T1=Adult Cattle

T2=Young Cattle

DISCUSSION

This study focused on the prevalence, characterization, and impact of hard and soft tick infestations in cattle at the Teaching and Research Farm, Federal University of Technology, Minna, Niger State. The findings revealed significant differences between the types of ticks infesting cattle, with

a higher prevalence of hard ticks compared to soft ticks. Furthermore, adult cattle exhibited a significantly higher tick burden than young cattle. These results align with previous studies that emphasize the predominance of hard ticks in livestock, particularly *Rhipicephalus* and *Amblyomma* species, which are known vectors for tick-borne diseases. It demonstrated that hard ticks (*Rhipicephalus spp.* and *Amblyomma spp.*) are more prevalent, with a mean infestation rate of 5.50 (± 1.29) compared to soft ticks, which had a mean rate of 3.50 (± 0.57). The P-value of 0.03 indicates a statistically significant difference between the two types of ticks, which suggests that hard ticks are more problematic for cattle on the farm. The high Eta square value (0.65) further supports this finding, indicating that hard ticks have a more substantial impact on cattle health. This is consistent with the work of Kasaija *et al.* (2021), who also reported higher infestation rates of hard ticks in cattle due to their longer feeding times and increased potential for transmitting diseases like babesiosis and anaplasmosis. Hard ticks, particularly *Rhipicephalus microplus*, have been well documented as primary vectors of cattle (Balinandi *et al.*, 2020) and this result is in line with my own study which shows hard ticks are more prevalent in cattle herds. Soft ticks, while less prevalent, are still significant due to their ability to feed on cattle intermittently, though their role in disease transmission is often considered less severe compared to hard ticks.

Table 4.2 shows that there is a prevalence of 54% *Amblyomma species* in teaching and research farm, followed by *Rhipicephalus species* at 46%, with *Ixodidae species* being. This high prevalence of *Amblyomma spp.* The study is in contrasts with earlier findings who reported that *Rhipicephalus spp are* dominated species with 56.59% and *Amblyomma species* with 43.35% of tick in his report (Eyo *et al*., 2014). This may be attributed to environmental factors, including vegetation density and humidity, which favor *Amblyomma* species. Age is an important consideration in tick infestation, with adult cattle (mean tick infestation of 6.25) being more heavily infested than young cattle (mean of 2.25). The Eta square value (0.73) suggests that age strongly influences tick burden, a finding supported by literature indicating that older cattle, due to their prolonged exposure to infested pastures, are more susceptible to tick infestation (Bianchi *et al.,* 2003). Additionally, adult cattle may have thicker skin, which facilitates tick attachment and feeding over extended periods, leading to higher tick burdens.

The high prevalence of hard ticks, especially in adult cattle, has serious implications for cattle health. Hard ticks, especially *Rhipicephalus microplus*, are known vectors of tick-borne diseases (TBDs) such as babesiosis and anaplasmosis. The heavy tick burden observed in adult cattle could lead to decreased productivity due to weight loss, anemia, and reduced milk yield. This high infestation of adult tick in this study aligns with the findings of Girma *et al.,* (2024). Who also reported similar high infestation in his studies, he further reported that adult ticks' ability to feed for long periods, leading to more severe health impacts compared to soft ticks, which feed for shorter durations.

CONCLUSION

This study concludes that hard ticks, particularly *Rhipicephalus spp.* and *Amblyomma spp.*, are more prevalent in cattle at the Teaching and Research Farm compared to soft ticks.

RECOMMENDATIONS

Based on the findings of this study, recommendations are made to manage and control tick (especially hard ticks) infestations in cattle. An integrated approach combining chemical acaricides with biological control methods should be implemented to manage the high prevalence of hard ticks. Also, frequent monitoring of tick populations should be conducted to detect changes in tick prevalence and species distribution, particularly for *Amblyomma spp.*, which had the highest prevalence in this study. Early detection of infestations can lead to timely intervention and prevent the spread of babesiosis and anaplasmosis. The study highlights the need for more effective tick control strategies to reduce the tick burden and prevent the spread of babesiosis and anaplasmosis.

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