



Full Length Research Paper

## IXODID TICKS INFESTATION OF ZEBU CATTLE CROSSES IN SOKOTO STATE NIGERIA

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### ABSTRACT

Ticks transmit different tick-borne diseases (TBD) in cattle and humans while their bites predispose the cattle to dermatophilosis which result in down-grade of hides and other production loses. Zebu Cattle (*Bos indicus*) Crosses found in 5 Local Government Areas of Sokoto State were sampled for ticks between February and July 2013. Body surfaces of the 498 cattle were visually examined and any tick found was manually detached and preserved in 70% ethanol and subsequently identified using the Keys to African Ticks. A total of 1528 hard ticks infested 288 cattle [infestation rate IR (%) = 57.3; mean tick burden, MTB (tick/cattle) = 5.44±1.21]. Generally, Bulls were more infested (IR=63.9; MTB=5.75±1.12) than cows (IR=54.4%; MTB=5.17±1.56). Among Zebu crosses, infestation was in the order Friesian-X (IR=61.2; MTB=6.1±1.1), Red Bororo (IR=60.0; MTB=5.0±9.56), Sokoto Gudali (IR=59.5; MTB=5.3±1.27), and White Fulani (IR=52.1; MTB=5.6±2.6). Genera of ticks identified were *Hyalomma* (60.9%), *Boophilus* (22.6%), *Rhipicephalus* (10.1%) and *Amblyomma* (6.4%) but percentage distributions by species were *Hyalomma truncatum* (18.4), *H. dromedarii* (15.4), *H. impeltatum* (9.4), *H. rufipes* (9.3), *H. impressum* (8.4), *Boophilus decoloratus* (8.2), *B. geigy* (7.5), *B. annulatus* (6.9), *Amblyomma variegatum* (6.4), *Rhipicephalus evertsi* (5.5), and *Rh. Sanguineus* (4.5). Sokoto is at risk of TBD outbreak. In man, TBDs are difficult to treat because they are often misdiagnosed as malaria or other febrile conditions. Effective tick-control strategies should be adopted by cattle owners, herdsmen and veterinary personnel to prevent wide-spread potential outbreak of TBDs considering the present activities of nomadic herdsmen in the country.

**Keywords:** Ticks, Cattle, Tick-borne diseases, Nomadic herdsmen, Sokoto.

### INTRODUCTION

Ticks are very important group of arthropod vectors of zoonotic diseases (George, 1987; Iwuala and Okpala, 1978) including Emerging Human Babesiosis (Ikpeze *et al.*, 2007). Effects of tick bites and dermatophilosis (Ikpeze, 2004),

infertility and other disease conditions of cattle (Dalis *et al.*, 2007) have been reported from Nigeria. Cattle is a major source of animal protein in Nigeria but since the developmental stages of ticks often quest on pasture to infest their vertebrate hosts (Ikpeze, 2012), grazing cattle are usually predisposed to heavy tick

infestation in Nigeria. Tick infestation on cattle therefore poses serious threat to cattle rearing and research in Nigeria. Transhumant pastoralists move their herds from northern to southern parts of Nigeria in search of greener pasture for their herds, and such movements naturally introduce ticks to new environments which are also suitable for the development, survival and maintenance of the ticks (Ikpeze *et al*, 2016; Ikpeze *et al*, 2011; Ikpeze *et al*, 2010). The present study focused on ticks infesting cattle in Sokoto State, Nigeria.

## MATERIALS AND METHODS

**Study Area: Sokoto State is the study area.** The study was carried out in five Local Government Areas that constitute Sokoto in Sokoto State in Nigeria. These are Sokoto North, Sokoto South, Kware, Wamakko, and Dange-Shuni LGAs. Sokoto (13° 04' N and 5° 14' E), the modern-day capital of Sokoto State (formerly, the North-western State) is located in the extreme northwest of Nigeria, near the confluence of Rivers Sokoto and Rima. The name Sokoto (a modern version of Sakkwato) is of Arabic origin, representing Suk or 'market'. It is also known as Sakkwato, Birnin Shaihu da Bello or Sokoto the Capital of Shaihu and Bello. Being the seat of the Sokoto Caliphate, the city is predominantly Muslim and an important seat of learning in Nigeria. The Sultan who heads the caliphate is effectively the spiritual leader of Nigerian Muslims (Tsoho, 2007). Sokoto State is bordered to the north by Niger Republic, to the South-West by Kebbi State, and to the east by Zamfara State. It is in the dry Sahel sandy savannah with isolated hills and an annual average temperature of 28.3°C (82.9°F). Generally

Sokoto, being one of the hottest cities in Nigeria has a maximum daytime temperatures of 40°C (104°F) most of the year but the dryness makes the heat bearable (Tsoho, 2007). There are two major seasons in Sokoto, namely wet and dry. The dry season lasts from October to April in some parts and may extend to May or June. The wet season on the other hand, begins in most parts of the state in May and lasts up to late September, or early October with annual rainfall of between 500mm and 800mm. Harmattan is a dry, cold and fairly dusty wind experienced in the state between November and February. Heat is more severe in the state in March and April, but the weather in the state is always cold in the morning and hot in the afternoons, except in the peak harmattan. The dusty harmattan wind from the Sahara desert dims the sunshine thereby lowering the temperatures significantly but dust settles everywhere in the houses. Sokoto North, Sokoto South, Kware, Wamakko, and Dange-Shuni Local Government Areas (LGAs) are the cattle rearing areas of Sokoto State, where the Fulani rear cattle in large numbers. Cattle population in Sokoto is about 17.1% of Nigeria's estimated 14.066 million cattle population, 81.9% of which were under pastoral system (Nuru, 1986).

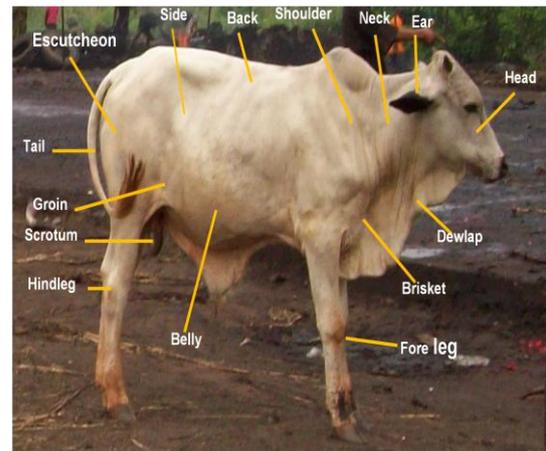
### Sampling and identification of ticks:

Visits were made twice in each of the months of February to July, 2013 to cattle-rearing areas in the study area for tick sampling. External surfaces of 498 of randomly selected Zebu Cattle (*Bos indicus*) crosses namely, Sokoto Gudali, White Fulani, Red Bororo, and Friesian-X (Plate 1) that are being reared in the study area were visually examined for ticks.



**Plate 1:** Zebu (*Bos indicus*) crosses. Sokoto Gudali [a], White Fulani [b], Red Bororo [c], and Friesian [d]

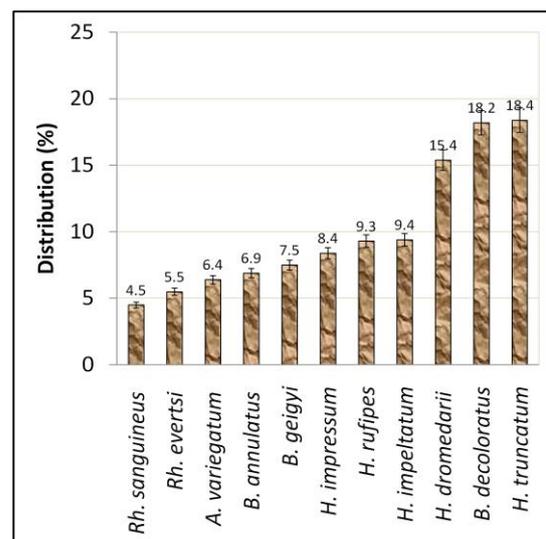
Ticks observed were removed with the aid of entomological forceps by the researchers and manually by the herdsmen who superimposed zoo psychology on the cattle to restrain them. According to Ikpeze (2012), the preferred sites of ticks sampled on cattle are head, ears, dewlap, neck, brisket, shoulders, forelegs, back, flanks, belly, tail, escutcheon, groins, scrotum, udder, rear-legs (Plate 2). Ticks recovered from each group of cattle were preserved separately in jam jars containing 70% alcohol with labels indicating sampled location, date, Cross-breed and sex of cattle, and number of ticks collected. Specimens were later identified to genera and species levels using colour Keys for the Identification of African Ticks (Okello-Onen, 1999). Voucher specimens were deposited in Zoology Unit, Department of Biological Sciences, Usmanu Danfodiyo University Sokoto, Sokoto State Nigeria.



**Plate 2:** Preferred sites of ticks on cattle (Ikpeze, 2012)

## RESULTS

The 1528 Ixodid ticks detached from cattle were distributed among the 11 species identified namely, *Hyalomma truncatum* 28 (18.4%), *H. dromedarii* 236 (15.4%), *H. rufipes* 142 (9.3%), *H. impressum* 129 (8.4%), *Boophilus decoloratus* 125 (8.2%), *B. annulatus* 105 (6.9%), *B. geigy* 115 (7.5%), *Rhipicephalus evertsi* 84 (5.5%), *Rh. Sanguineus* 69 (4.5%) and *Amblyomma variegatum* 98 (6.4%). From Figure 1 it could be noticed that the genera *Hyalomma* and *Boophilus* were more dominant than *Rhipicephalus*, *Amblyomma*, and *Boophilus*.



**Figure 1:** Distribution of tick species on cattle in Sokoto

Mean infestation rates (IR) and mean tick burdens (MTB) regarding 288 tick-infested cattle (115 bulls and 173 cows) among the 498 sampled (180 bulls and 318 cows) were presented in Table 1. Bulls had

more tick burdens than cows (Table 2) while among the Zebu Cattle Crosses, Friesian-X was most susceptible to tick infestation (Table 3).

**Table 1:** Tick infestation of cattle in Sokoto

LGA	Examined (No.)	Infested (No.)	IR (%)	MTB (Ticks/cattle)
Sokoto North	120	81	67.5	4.2
Sokoto South	95	49	51.6	5.4
Kware	96	52	54.2	6.6
Wammako	92	54	58.7	7.0
Dange-shuni	95	52	54.7	4.0
<b>Total/ means</b>	<b>498</b>	<b>288</b>	<b>57.34±5.56</b>	<b>5.44±1.21</b>

**Table 2:** Tick infestation of bulls and cows in Sokoto

LGA	Examined		Infested		Infestation rate%		Tick burden	
	Bull	Cow	Bull	Cow	Bull	Cow	Bull	Cow
Sokoto North	31	89	25 <sup>a</sup>	56 <sup>b</sup>	80.6	62.9	6.0 <sup>1</sup>	3.34 <sup>2</sup>
Sokoto South	34	61	20 <sup>b</sup>	29 <sup>b</sup>	58.8	47.5	5.1 <sup>1</sup>	5.55 <sup>1</sup>
Kware	34	62	20 <sup>b</sup>	32 <sup>b</sup>	58.8	51.6	6.95 <sup>1</sup>	6.34 <sup>1</sup>
Wammako	41	51	25 <sup>b</sup>	29 <sup>b</sup>	60.9	56.8	6.8 <sup>2</sup>	7.24 <sup>1</sup>
Dange-Shuni	40	55	25 <sup>c</sup>	27 <sup>b</sup>	62.5	49.1	3.92 <sup>1</sup>	3.4 <sup>1</sup>
<b>Total / Mean</b>	<b>180</b>	<b>318</b>	<b>115</b>	<b>173</b>	<b>64.32±8.25</b>	<b>53.58±5.62</b>	<b>5.75±1.12<sup>1</sup></b>	<b>5.17±1.56<sup>1</sup></b>

Values in the same row with different superscripts differ significantly at P<0.05

Mean in the same row with different superscripts differ significantly at P<0.05

**Table 3:** Tick infestation among the 4 Zebu Cattle crosses reared in Sokoto

LGA	Sokoto Gudali		Red Bororo		White Fulani		Friesian-X	
	IR	TB	IR	TB	IR	TB	IR	TB
Sokoto North	80.9	4.76 <sup>1</sup>	62.9	4.65 <sup>1</sup>	65.5	3.31 <sup>1</sup>	64.7	5.27 <sup>1</sup>
Sokoto South	50.0	6.46 <sup>1</sup>	62.5	5.33 <sup>1</sup>	24.0	4.17 <sup>2</sup>	75.0	4.93 <sup>1</sup>
Kware	81.5	4.51	58.3	7.29 <sup>2</sup>	28.0	10.7 <sup>3</sup>	45.0	7.33 <sup>2</sup>
Wammako	46.2	7.08	53.8	7.93 <sup>1</sup>	70.6	6.08 <sup>1</sup>	76.2	7.5 <sup>1</sup>
Dange-Shuni	42.3	3.64 <sup>a</sup>	62.9	3.41 <sup>1</sup>	62.5	4.0 <sup>1</sup>	45.0	5.33 <sup>1</sup>
<b>Means</b>	<b>60.2±17.3</b>	<b>5.3±1.27</b>	<b>60.1±3.5</b>	<b>5.0±9.56</b>	<b>50.1±19.9</b>	<b>5.6±2.6<sup>a</sup></b>	<b>61.2±13.8</b>	<b>6.1±1.1</b>

\*Values in the same row with different superscripts differ significantly at P<0.05;

Mean of the same row with different superscripts differ significantly at P<0.05

## DISCUSSIONS

Mean IR (57.34±5.56) observed in this study were similar to IR 64.2 recorded for Zebu cattle reared in Minna metropolis, Niger State by Ejima *et al.* (2014) but

considered relatively higher than 46.21% observed in goats at Sokoto (Ahmed *et al.*, 2003). Perhaps the practice of intensive system of goat husbandry may allow for more frequent de-ticking in goats than in

cattle under nomadic grazing. Though ticks are ubiquitous on cattle and other domestic animals in Nigeria (Dipeolu, 1975; Ikpeze, 2010; Ikpeze *et al.*, 2011; Ejima and Ayegba, 2011), they usually peak in pasture between February and July, which coincided with this study period, and that may be responsible for the high infestation recorded. A study on abundance of ticks elsewhere in Nigeria (Ikpeze *et al.*, 2016) also reported that infestation rate and tick burdens decreased during the dry season, and gradually increased during the rainy season.

Prevalence of ticks on bulls was higher in cows (see Table 2) and this might be explained by the fact that greater care is usually given to milk-cows, which might result in their more frequent de-ticking than bulls. This result agreed with George *et al.* (2008) who reported that male cattle are more infested with ticks than the female ones even when both are moved together from place to place. George *et al.* (2008) studied the problem of acaricides used for controlling ticks on cattle and observed that special care is given to cows over the bulls probably because milking deserves more frequent handling of the cows, hence their more frequent de-ticking by herdsmen.

Although the prevalence of infestation was highest on Friesian-X, there was no significant difference ( $p>0.05$ ) in both mean IR and MTB among the Zebu crosses. However in a similar work at Awka on Zebu Crosses derived from Northern Nigeria, Ikpeze *et al.* (2015) reported significant differences ( $p<0.05$ ) in average tick burdens between White Fulani (1.59), Red Bororo or Red Fulani (8.15), and Sokoto Gudali (3.0). The

distribution of ticks on these breeds at Awka suggested that the ticks might be host-specific but contrary was the case at Sokoto where the ticks seemed not but needed blood meal of hosts for survival.

Species of ticks observed were the same noticed on cattle brought from Northern Nigeria for sale in Enugu and Anambra States' Cattle Markets (Ikpeze *et al.*, 2011). *Hyalomma truncatum*, a desert tick, was the most abundant species in the study area. Sokoto State seemingly provides an ideal environment for *Hyalomma truncatum*, which prefers lowlands and sub humid areas that receives less than 500mm of rainfall annually (Bayer and Maina, 1984). Dipeolu (1975) had recorded few numbers of *Hyalomma truncatum* on cattle, sheep and goat in Western Nigeria where the annual rainfall is above 800mm. *Hyalomma dromedarii* of camel, which infested 57.6% of camel in Kano (Lawal *et al.*, 2007) was not unexpected on cattle at Sokoto since cattle and camels were usually observed together in the study area. This tick transmits pathogens that cause diseases of economic importance to livestock industries (Olabode *et al.*, 2010). *Boophilus decoloratus*, also one of the dominant species encountered in Sokoto, is a one-host tick and spends its entirely life cycle on the same individual host (Ikpeze, 2012). It has long been incriminated as a vector of *Babesia bigemina*, *Anaplasma marginale* and *Anaplasma central* which are endemic in Nigeria (Leeflang and Ilemobade, 1977). *Amblyomma variegatum* is of veterinary importance too, as it transmits the mildly pathogenic *Theileria mutans* (Saidu *et al.*, 1984) which is prevalent in Nigeria. Bites of *A. variegatum* do not only cause dermatitis but they mechanically transmit

*Dermatophilus congolensis* responsible for Dermatophilus infection – a condition in cattle which have been known to damage hides and skin (Ikpeze, 2004; Mohammed, 1974).

## CONCLUSION

Four genera of ticks namely, *Hyalomma*, *Boophilus*, *Amblyomma* and *Rhipicephalus* species, which have been proven to be efficient transmitters of different tick-borne diseases (TBDs) of man and animals, were identified from local crosses of Zebu cattle kept under pastoral system in Sokoto metropolis. TBDs in humans are difficult to treat because they are often misdiagnosed as malaria or other febrile human illnesses. There is need for effective tick-control strategies to be adopted by stake holders like cattle owners, herdsman and veterinary personnel in order to avert nationwide outbreak of TBDs in human and animal populations in view of the present migrating activities of nomadic herdsman in the country which may introduce potentially infected ticks to new environments.

## REFERENCES

- Ahmed, A., Adamu, Muhammed, H., Auwalu, B. (2003). Survey of Ixodid ticks in goats in Sokoto, Nigeria. *Bulletin of Animal Health and Production in Africa*, 51(1): 55-58.
- Bayer, W. and Maina, J.A. (1984). Seasonal pattern of tick load in Bunaji cattle in the sub-humid zone of Nigeria. *Veterinary Parasitology*, 75:301-307.
- Dalis, J.S., Kazeem, F.I.M., Makinde, A.A. and Fatihu, M.U. (2007). Agalactia due to severe generation dermatophilosis in a White Fulani colour in Zaria, Nigeria. *Journal of Veterinary Science (VJVS)*, 1(4):56-58.
- Dipeolu, O.O. (1975). The incidence of ticks of *Boophilus* species on cattle, sheep and goats in Nigeria. *Tropical Animal Health Production*, 7:35-39.
- Ejima, I.A.A and Ayegba, A.E. (2011). Relative abundance of hard ticks on reared cattle (Family: Bovidae: *Bos* spp.) in Idah LGA. Kogi State Nigeria. *The Zoologist*, 9: 9-16.
- Ejima, I.A.A., Obayumi, M., Olayemi, I.K. and Dangana, M.C. (2014). Tick infestation among cattle in Minna metropolis, Niger State, Nigeria. *Research Journal of Applied Sciences*, 9(3): 126-132.
- George, B.D.J. (1987). Prevalence of Ixodid ticks on sheep in Zaria area and a study of the Larmoolymph cell types of *B. decoloratus*. M.Sc. Thesis. Department of Veterinary Parasitology and Entomology, ABU, Zaria.
- Ikpeze, O.O. (2012). Ecology of ticks (Acarina: Ixodidae) on cattle in Nnamdi Azikiwe University, Awka Anambra State, Nigeria. PhD Dissertation, Department of Parasitology and Entomology, Nnamdi Azikiwe University Awka, 102pp
- Ikpeze, O.O. (2010). Distribution of parasitic ticks (Acarina: Ixodidae) on cattle at designated cattle markets in Enugu, Ugwuoba and Amansea, south-eastern Nigeria. *International Journal of Biological Science*, 2(3): 51-55.
- Ikpeze, O.O. (2004). Dermatophilosis infection in Nigeria: a mini review. *Bio-Research*, 2(2): 37-41.
- Ikpeze, O.O., Eneanya, C.I., Chinweoke, O.J., Aribodor, D.N and Anyasodor,

- A.E. (2011). Species diversity, distribution and predilection sites of ticks (Acarina: Ixodidae) on trade cattle at Enugu and Anambra States, south-eastern Nigeria. *The Zoologist*, 9:1-8.
- Ikpeze, O.O., Eneanya, C.I and Onyido, A.E. (2016). Abundance of ticks in pasture at Nnamdi Azikiwe University, Awka. *Advances in Bioresearch*, 7(2): 124-131.
- Ikpeze, O.O., Eneanya, C.I. and Nwokedi, O.J. (2007). Environmental surveillance of canine babesiosis as an early alert system on emerging human babesiosis. *Journal of Advancement in Medical and Pharmaceutical Science*, 1(3): 19-23.
- Ikpeze, O.O., Eneanya, C.I and Onyido, A.E. (2015). Burden, seasonality, sex ratio and preferred sites of ticks of public health importance on cattle found at Amansea, Anambra State Nigeria. *International Journal of Research – Granthaalayah*, 3(12): 61-71.
- Iwuala, M.O.E. and Okpala, I. (1978). Studies on the ectoparasite fauna of Nigeria. Livestock I: types and distribution patterns on hosts. *Bulletin of Animal Health Production in Africa*, 16: 339-349.
- Lawal, M.D., Ameh, I.G. and Ahmed, A. (2007). Some ectoparasite of *Camelus dromedarius* in Sokoto. *Nigerian Journal of Entomology*, 4(2):143-148.
- Leeflang, P. and Ilemobade, A. (1977). Tick-borne diseases of domestic animals in Northern Nigeria. *Tropical Animal Health Production*, 9:211-218.
- Mohammed, A.N. (1974). Seasonal incidence of Ixodid ticks of cattle in Nigeria and in the Northern lands in particular reference to their role in the transmission of bovine Piroplasma. Ph.D Thesis Department of Parasitology and Entomology, ABU Zaria.
- Nuru, S. (1986). *Livestock research in Nigeria*. In: R. von Kaufmann, Chater, S. & Blench, R. (Eds.) Proceedings of ILCA/NAPRI Symposium, Kaduna, Nigeria.
- Okello-Onen, J., Hassan, S.M. and Essuman, S. (2004). Taxonomy of African Ticks: An Identification Manual. 124 pp. ICIPE Science Press, Nairobi.
- Olabode, H.O.K., Silas, P.M. and Agbede, R.I.S. (2010). Survey of ectoparasites and their predilection sites on cattle in Bukuru Market. *Journal of Agricultural and Veterinary Science*, 2: 20-74.
- Saidu, S.N., Abdulkadir, I.A. and Akerejola, O.O. (1984). *Theileria mutans* infection in Nigeria cattle. *Tropical Animal Health and Production*, 16: 149-152.
- Tsoho, U.K. (2007): Growth and History of the establishment of Makera Asada in Sokoto metropolis, B.A. project, History Department", Usmanu Danfodio University, Sokoto.