



## Assessment of Tick Infestation and its Effects on Growth of Extensively Managed Cattle in Ogun State, Nigeria.

ODUGUWA, B.O.<sup>1\*</sup>, OLOYO, O.O.<sup>2</sup>, TALABI, A.O.<sup>3</sup>, SOGUNLE, O.A.<sup>4</sup>, OKWELUM, N.<sup>1</sup> and OLOYO, R.A.<sup>5</sup>

<sup>1</sup>Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR), <sup>2</sup>Ogun State Agricultural Development Programme (ADP), Abeokuta, Ogun State, <sup>3</sup>College of Veterinary Medicine, <sup>4</sup>College of Animal Science and Livestock Production, Federal University of Agriculture, PMB 2240, Abeokuta, Nigeria, <sup>5</sup>Federal Polytechnic, Ilaro, Ogun State, Nigeria.

\*Corresponding Author; oduguwabo@funaab.edu.ng; or oduguwabmdl@gmail.com

### SUMMARY

One hundred and twenty cattle of ages of <1 year and  $\leq 3$  years old were used to study the effects of tick infestation on linear body measurements, haemoparasites, and rectal temperature. Twenty cattle herds, each from 6 Local Government Areas (LGA) of Ogun State, namely Yewa South, Ado-Odo/Ota, Ipokia, Yewa North, Imeko-Afon and Odeda LGAs were used. Estimation of total tick infestation per animal was done by collecting ticks manually from half of the body of the cattle and multiplying by two. Height at withers, heart girth and body length of the sampled animals were measured in centimetres (using measuring tape) to determine the growth performance of the animals. The data generated were subjected to One-Way Analysis of Variance. Also, correlation and regression analyses were carried out to determine relationships among variables. The results indicated that the mean occurrence of tick infested cattle was 45.42%. The least occurrence (35.00%) was observed in Odeda LGA in the derived savannah vegetation, while the highest occurrence (58.83%) was recorded in Yewa South LGA. Tick infestation rate was more pronounced in July and decreased progressively towards December. Older animals (2-3 years) were

more susceptible to tick infestation than the younger ones. Prevalence of tick species identified in order of frequency was *Rhipicephalus* spp (34.02%), *Boophilus* spp (31.58%), *Ambylomma* spp (31.285), and *Hyalomma* spp (3.12%). Linear body measurements of cattle in this study showed that heart girth, height at withers and body length increased ( $P > 0.05$ ) with tick infestation. Also, rectal temperature and level of haemoparasites decreased ( $P < 0.05$ ) with tick infestation. *Babesia* and *Anaplasma* were the tick-borne parasites found in blood of infested cattle. It was concluded that, cattle reared in Ogun State are prone to tick infestation due to the enabling prevailing vegetation and climatic conditions.

**KEY WORDS:** Ticks, Haemoparasites, Cattle, Growth, Ogun State.

## INTRODUCTION

In livestock farming enterprise, parasitic diseases constitute major obstacles in maintaining good health and high productive performance of the herd thus resulting in economic loss to the farming business (Jonsson *et al.*, 2001). The economic importance of ticks had long been recognized due to their ability to transmit diseases to animals (FAO, 1984).

Generally, activities of ticks vary with the dominant species, ecological zone and climatic changes. Indeed, variation noted in the seasonal activities of ticks in different countries or agro-ecological zones were attributed to differences in species of the predominant ticks and variation in photoperiod (Dipeolu, 1989). The magnitude of losses due to tick infestation varies with genotype of cattle (Magona *et al.*, 2011), the species of infesting ticks (Wang *et al.*, 2007) and level of infestation (Stachurski and Lancelot, 2006). Moreover within a genotype, losses per tick unit increase with the number of attached ticks (Abunna *et al.*, 2009).

An assessment of the incidence and prevalence of ticks in Bunaji cattle herds in the sub-humid Nigeria under traditional management revealed that tick load was low in the dry season, increased after the onset of the first scattered rains, reached a peak 1 month after the beginning of heavy rains, and declined thereafter. The dominant tick species was *Ambylomma variegatum*; *R. tricuspis* and *Hyalomma* spp. (Maina, 1986). A survey of tick species responsible for lameness in goats in Sokoto, North-Western Nigeria incriminated *Ambylomma variegatum*, *Hyalomma dromedarii* and *Hyalomma rufipes* (Lawal *et al.*, 2008). The main disease problems among Zebu cattle in southern Nigeria are trypanosomiasis, streptothricosis, tick-borne disease and helminthosis (FAO, 1984).

Knowledge of tick numbers on the cattle provides useful information on tick population

dynamics of disease transmission and estimate of resistance of different hosts (Norval *et al.*, 1992).

Majority of cattle farmers in the area of study, Ogun State, are agro-pastoralists and small holders. Different studies have been conducted on various parts of the country and from abroad. However, such information for Ogun State is lacking. Therefore this investigation was initiated to study distribution and assessment of ticks in extensively managed cattle in Ogun State, South-western Nigeria.

## MATERIALS AND METHODS

### Study Area

Ogun State of Nigeria constituted the study area for assessment of tick infestation of cattle. The State is located in the south-west of Nigeria and lies within longitudes 2° 45' E and 4° 45' E and latitude 6° 15' N and 7° 60' N. The climate is characterized by consistently high temperature ranging between 22°C and 35°C for most of the year. Annual rainfall is between 1800 – 3000 mm. There are two types of vegetation zones in the state, namely forest vegetation in the southern part and derived savannah in the northern part (Onakomaiya *et al.*, 2000).

### Study Design

Six Local Government Areas (LGA), namely Ipokia, Ado-odo/Ota, Yewa South, Yewa North, Imeko-Afon and Odeda were used for the study. Each LGA was structured into circles along the model of Ogun State Agricultural Development Programme (OGADEP). Village Extension Agents (VEAs) of OGADEP in each of the circles were used for identification and location of cattle farmers, and for administration of oral interview and questionnaires. Oral interview and questionnaires were administered before the commencement of the study to acquaint the farmers with the study and also to know where to take samples. The farmers were already accustomed to the OGADEP officials who were part of the research team that visited the farms so they readily agreed to be interviewed

and also allowed their animals to be used as subjects in the study.

### Sample Collection

Cattle were randomly sampled from each of the herds for the survey of ticks' infestation. Sample size depended on the population of the herd. One hundred and twenty (120) animals were sampled, twenty animals in each Local Government Area. Estimation of total tick infestation per animal was done by collecting ticks manually from half of the body of the cattle and multiplying by two as described by (Bekele, 2002). Ticks were placed in a pre-label sampling bottle and filled with 10% formaldehyde. The place where ticks were collected and date the specimen were collected were pasted on the bottle.

Height at withers, Heart Girth and Body Length of the sampled animals were measured in centimetres employing the use of a measuring tape to determine the growth performance of the animals.

Field information collected included name of farmer, Animal identification number, month of observation, age and body conformation. Blood samples were collected from all tick-sampled cattle after taking the rectal temperature. About 5 ml of blood was taken through the jugular vein into properly label sterile bijou bottles containing 250 $\mu$ l of 200nM Na<sub>2</sub> Ethylene diamine tetra acetate (EDTA) and taken to the laboratory for examination. These were assessed for haematology and haemoparasites.

### Identification of ticks

The identification of ticks for genera and species was carried out in the Department of Veterinary Microbiology and Parasitology, College of Veterinary Medicine, University of Agriculture, Abeokuta. Each tick sampled was placed under the stereomicroscope (x20), sorting and identification were done as described by Soulsby (1982).

Parasitological examination was done by

microhaematocrit buffycoat method (Urquhart *et al.*, 2000).

Statistical Analysis

Completely Randomized design was used to analyze the data using the SPSS 10.0 for Windows (SPSS 2001).

The model for analysis of variance

$$Y_{ij} = \mu + T_i + \epsilon_{ij}$$

Where

$Y_{ij}$  = observed value of dependent variables (Output)

$\mu$  = population mean or inherent factor

$T_i$  = effect of the  $i$ th treatment

$\epsilon_{ij}$  = random residual or experimental error.

Duncan's Multiple Range Test of the same software was used to separate the means where differences ( $P < 0.05$ ) exist. In addition, correlation and regression analyses were carried out to determine relationships among variables.

### RESULTS

Prevalence of tick species picked from the infested animals in the various local government areas of Ogun State is shown in Table 1. Four genera of ticks identified from the infested animals included *Amblyomma*, *Boophilus*, *Rhipicephalus* and *Hyalomma*. Species identified were *A. variegatum*, *A. hebraeum*, *B. decoloratus*, *R. appendiculatus* and *Hyalomma* spp. Then most commonly infested ticks were belonging to the genus *Rhipicephalus*

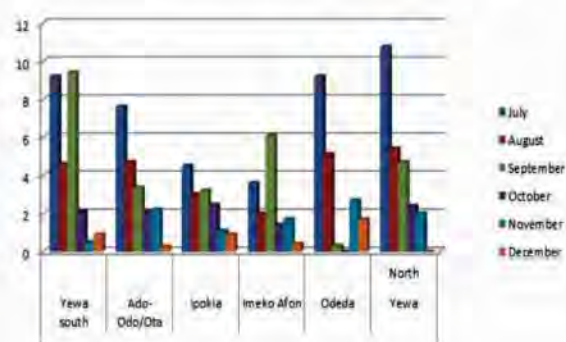
**Table I: Population of Tick Species infesting cattle extensively-managed in six Local Government Areas of Ogun State**

Local Govt. Area	Tick species					TOTAL
	AV	AH	BD	RA	HY	
Yewa south	375	12	48	22	74	
Ado-odo/Ota	53	102	0	264	0	
Ipokia	90	0	216	0	0	
Yewa North	88	0	234	162	0	
Imeko/Afon	20	0	54	230	0	
Odeda	18	0	198	128	0	
Total	629	114	750	808	74	
%	26.48	4.80	31.58	34.02	3.12	100

AV is *Amblyomma variegatum*; AH is *Amblyomma herbraeum*; BD is *Boophilus decoloratus*; RA is *Rhipicephalus appendiculatus* while HY is *Hyalomma* spp

(34.02%) followed by *Boophilus* (31.58%), *Amblyomma* (31.28%) and *Hyalomma* (3.12%). The pattern of occurrence of the genus of ticks showed that *Amblyomma* was prevalent in Yewa South and Ado-Odo/Ota, whereas *Boophilus* and *Rhipicephalus* were common in Ipokia, Yewa North, Imeko-Afon and Odeda LGAs. *Hyalomma* was found only in Yewa South LGA. Figure 1 shows the monthly mean tick population in

**Figure 1: Monthly variation in average tick population in cattle across six Local Government Areas of Ogun**



cattle across different local government Figure 1: Monthly variation in average tick population in cattle across six Local Government Areas of Ogun State areas of the state. Also, it depicts seasonal variation on the rate of tick infestation of the animals. Mean tick population was significantly affected by local government area and the month of year ( $P > 0.05$ ). Overall monthly mean value of rate of tick infestation was highest in July ( $7.48 \pm 0.450$ ) and least in December ( $0.73 \pm 0.450$ )

Variation of tick infestation rate across the LGAs indicated that the least infestation rate was found in Ipokia ( $2.51 \pm 0.444$ ) and Imeko-Afon ( $2.53 \pm 0.437$ ) LGAs, whereas the highest was noted in Yewa South ( $4.45 \pm 0.483$ ) and Yewa North ( $4.21 \pm 0.438$ ) LGA. Infestation rate was mild in Odeda ( $3.17 \pm 0.432$ ) and Ado-Odo/Ota ( $3.40 \pm 0.441$ ) LGAs. Table II shows the relationship between tick infestation and the linear body measurements, haematology, rectal temperature and body conformation.

Results of the effects of age and sex of cattle on tick infestation are shown in Table III. Tick infestation was significantly affected by both factors ( $P < 0.05$ ). However, mean tick infestation was significantly higher in female ( $3.48 \pm 0.215$ ) than in male ( $2.81 \pm 0.300$ ) animals. Mean tick infestation was found in animals that were less than 1 year old, while animals between ages 2 and 3 years old had the highest ( $5.42 \pm 0.318$ ) rate.

Parasites found in the blood samples obtained from the animals used in this study included *Babesia*, *Trypanosome* and *Anaplasma*. The frequency of occurrence of the parasites is shown in Table IV. The results showed that *Babesia* was the most common parasites in the blood of the animals.

Overall mean rectal temperature of the animals was  $38.58 \pm 0.029^\circ\text{C}$  (Table V).

**Table II: Regression equation describing the relationship between tick population and blood parameters, rectal temperature and linear body measurements**

Dependent	Mth	Rsqr	d.f	F	Sigf	Bo	b1	b2
Packed Cell Volume	LIN	0.113	717	10.9.81	0.000	29.6829	-0.2137	
	QUA	0.113	716	55.06	0.000	29.7162	-0.2394	0.0012
Red Blood Cell	LIN	0.070	717	54.11	0.000	8.0964	-0.0645	
	QUA	0.072	716	27.86	0.000	8.0682	-0.0427	-0.0010
White Blood Cell	LIN	0.000	717	0.28	0.597	8.8499	-0.0089	
	QUA	0.003	716	0.90	0.408	8.7970	0.0320	-0.0018
Haemoglobin	LIN	0.81	717	62.86	0.000	8.9562	-0.0538	
	QUA	0.81	716	31.39	0.000	8.5561	-0.0537	-4E-06
Rectal Temperature	LIN	0.135	718	112.06	0.000	38.4288	0.0479	
	QUA	0.135	717	56.16	0.000	38.4359	0.0424	0.0002
Height Girth	LIN	0.004	718	2.55	0.111	105.736	0.1574	
	QUA	0.005	717	1.78	0.170	105.990	-0.0397	0.0089
Height at Withers	LIN	0.001	718	0.64	0.425	93.2282	0.0747	
	QUA	0.004	717	1.42	0.242	93.5841	-0.2009	0.0124
Body Length	LIN	0.000	718	2.1E-04	0.988	89.3250	0.0012	
	QUA	0.003	717	1.12	0.325	89.6471	-0.2482	0.0112
Body Conformation	LIN	0.037	718	27.24	0.000	2.7895	-0.0142	
	QUA	0.052	717	19.75	0.000	2.8133	-0.0326	0.0008

Mth-Mathematical Relationship;Rsqr -Regression Coefficient;d.f=Degree of Freedom;F-Statistics;Sigf-Significant;bo-;b1=;b2=; LIN-Linear Relationship; QUA-Quadratic Relationship

Rectal temperature was significantly

TABLE III: Effect of age and sex of cattle on tick infestation

Age	Sex				Mean	SEM
	Male		Female			
	Mean	SEM	Mean	SEM		
<1 yr	1.26	0.294	1.43	0.290	1.38 <sup>c</sup>	0.330
1-2yrs	2.66	0.393	3.32	0.470	3.04 <sup>b</sup>	0.301
2-3yrs	4.64	0.748	5.82	0.611	5.42 <sup>a</sup>	0.318
Mean	2.81 <sup>b</sup>		3.48 <sup>a</sup>			
SEM	0.300		0.215			

<sup>c</sup>Means denoted by different superscripts in a column are significantly different (P<0.05)

<sup>b</sup>Means denoted by different subscripts in a row are significantly different (P<0.05)

TABLE IV: Effect of tick population on the occurrence of haemoparasites among cattle

Haemoparasites	Number of cattle showing haemoparasites	
	Frequency	%
<i>Babesia</i> only	45	6.3
<i>Trypanosoma</i> only	35	4.9
<i>Anaplasma</i> and <i>Babesia</i> only	13	1.8
<i>Trypanosoma</i> and <i>Babesia</i> only	24	3.3
<i>Anaplasma</i> , <i>Babesia</i> and <i>Trypanosoma</i> only	2	0.3
None	601	83.5
Total	720	100.0

(P<0.05) affected by tick infestation. Also, the results indicated that age of animal significantly affected the rectal temperature. Rectal temperature increased significantly (P<0.05) with age where the youngest animal group recorded the least value (38.43 ± 0.052°C) and oldest group recorded the highest value (38.72 ± 0.048°C). However, there was no significant (P>0.05) difference between the rectal temperature of the older (1-2years) and oldest animals (2-3 years). Results of body linear measurements shown in Table VI revealed that overall mean heart girth, height at

withers and body length were 106.27 ± 0.584cm, 93.48 ± 0.553cm and 89.33 ± 0.495cm respectively. These parameters were significantly affected by age of the animals (P<0.05). Animals less than 1 year old had the least mean values of the body linear measurement, while those between the ages of 2 to 3 years had the highest values.

### DISCUSSION

Ticks are among the most economically important ectoparasites of cattle (Bekele, 1996). They were identified as the main ectoparasites of cattle in the sub-humid zone of Nigeria (Maina, 1986). Occurrence of tick infestation in cattle across the various local government areas of Ogun State confirmed the earlier reports of the existence and problem of tick infestation in sub-humid zone of Nigeria.

Results of monthly variation of tick infestation rates revealed that infestation was more prevalent in the wetter months of July and decreased progressively towards drier month of December. These observations were in agreement with the reports of Lightfoot and Norval (1982), Dipeolu (1985), Maina (1986) and Norval *et al.* (1992) Corbet *et al.* (2006) The authors noted that prevalence of ticks varied with time or season of the year and space (between habitat and ecological zone) due to interactions of numerous factors, such as diversity and climate. They reported more pronounced infestation in the wet season of the year.

Ticks species found on infested cattle in the present study in order of prevalence included *Rhipicephalus appendiculatus*, *Boophilus decoloratus*, *Amblyomma variegatum*, *Amblyomma hebraeum* and *Hyalomma* spp. The results obtained in this study are in agreement with those of earlier workers. For examples, Dipeolu and Ogunji (1977) observed that *Amblyomma variegatum* and *Hyalomma rufipes* were predominant ticks in the Western Nigeria. Also, Bayer and Maina

(1984) observed that the most common ticks in Bunaji cattle in sub-humid Nigeria were *Ambylomma variegatum*, *Boophilus decoloratus*, *Rhipicephalus* spp, and *Hyalomma* spp, in order of frequency. Lawal *et al.* (2008) reported that *Ambylomma variegatum*, *Hyalomma dromedarii* and *Hyalomma rufipes* were prevalent in goats reared in North-Western Nigeria.

However, the results obtained in this study revealed that within the age range of less than 1 year and 3 years, tick infestation was positively correlated with age of cattle. Also, female animals were more infested than the male animals.

Furthermore, the results of the present study showed that rectal temperature and level of haemoparasites increased with tick infestation. *Babesia* and *Anaplasma* were the tick-borne parasites found in blood of infested cattle however, no clinical cases were recorded. The animals were either fatty or fair in body conformation suggesting that a state of endemic stability existed.

A review of earlier reports on the effect of tick infestation on productive performance of livestock revealed that infestation did not lead to loss in weight; rather it caused poor weight gain (Dipeolu, 1989). Linear body measurements of cattle in this study showed that heart girth, height at withers and body length increased but not significantly with tick infestation. The increase in these growth parameters might be due to the stage of growth of the young animals; and that the growth rate of the young animals might have overcompensated for the adverse effect of the infestation on weight gain.

## CONCLUSION

Tick infestation rate was more pronounced in July and decreased progressively towards December. Furthermore, older animals (2-3years) were more susceptible to tick infestation than the younger ones. Cattle reared in Ogun State are prone to tick infestation

because of the enabling prevailing vegetation and climatic conditions. The potential economic loss due to poor productive and health performance caused by tick infestation calls for the adoption of adequate tick infestation control measures which must be targeted more in the wet season when the risk and prevalence of tick infestation is high. This is also true of the more humid low land rain forest vegetation zone of the state.

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