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Original Research Article

# HELMINTHS AND TICK CO-EXISTENCE IN CATTLE IN MAIDUGURI BORNO STATE

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## ABSTRACT

Cattle are important livestock raised for their meat, milk and hides. They are also very important livestock animal because of their ability to convert forage, crops and household residues into meat, fiber, skins and milk. The prevalence of ticks and helminths co-infection in Maiduguri, Borno State was studied. Faecal samples and ticks were randomly collected from 312 cattle in different locations across Maiduguri metropolis. The collected samples were transported to the Veterinary Parasitology Research Laboratory, Faculty of Veterinary Medicine, University of Maiduguri, Borno State to determine the types of helminths eggs present in faeces using flotation technique and also to identify the ticks using taxononomic keys. An overall prevalence of 63.78% was observed for strongyle type eggs in cattle of different breeds ($p>0.05$). Wadara breed had the highest prevalence with 76.04% and Bunaji was the least ($P=0.0119$). Male cattle had the higher prevalence (75%) of faecal gastrointestinal helminth infection, while the female cattle had 50.69% ($P=0.001$). Preputial region had the highest number of ticks collected (300) while the neck region had the lowest (80). Female cattle had the highest number of collected ticks (789) compared with the male cattle with 484 tick samples. Therefore from this, helminth infection and tick infestation do co-affect cattle in Maiduguri metropolis.

**Keywords:** Helminths, Ticks, Infestation, Cattle, Maiduguri

## INTRODUCTION

Cattle are classified as livestock which refer to farm animals but poultry being an exception, cattle are important livestock raised for their meat, milk, hides, skin and for mainly economic purpose also they are important due to their ability to convert forage crops and household residues into meat, fibre, skins and milk (Lawal-Adebolawale, 2012; Owhoeli *et al*., 2014). However, the usefulness of cattle is truncated by helminths and ticks' infections.

Ticks are significant vectors of pathogens (bacteria, viruses, protozoa) causing diseases such as Lyme disease, anaplasmosis, babesiosis, and tick-borne encephalitis (Yu *et al*., 2015; Rochlin & Teldo, 2020). Helminthosis has been recognized as a serious threat to cattle production world-wide (Biu *et al.*, 2009). These effects are most significant in developing countries, with gastrointestinal helminths ranked as the most important livestock disease in a global study that ranked livestock disease significance according to their



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impact (Perry *et al*., 2002), with the majority of the world's poor livestock keepers in Sub-Saharan Africa (Grace *et al*., 2017). Tick infestations and helminths infections are the major constraints and resultant economic losses in cattle production around the world (Squire *et al*., 2019). These findings provide insight into the prevalence of helminth and ticks co-infection. Therefore, this study will help in obtaining data that will give an insight into the prevalence, prevent or mitigate the zoonotic potential and economic impact on farmers and livestock owners.

## MATERIALS AND METHODS

### THE STUDY AREA

The study was carried out in Maiduguri, the capital and largest urban centre in Borno State, Nigeria. Maiduguri lies between latitude 11°51'N and longitude 13°05'E with a human population of 521,492 based on the 2006 census (Nigerian Bureau of Statistics, 2011). It has two different seasons, the raining season which last for three-five months from early June-October with an annual rain fall of about 500-600mm and the dry season which starts from November and last up to May, therefore the climate of Maiduguri is characterized by a long period of dry season for the rest of the year (Hess *et al.,* 1995).


Source: Google map

### STUDY POPULATION AND SAMPLING METHOD

A total of 312 cattle comprising Red Bororo, Wadara, Adamawa Gudali, Abore, Bokoloji, Ndama and Bunaji breeds were randomly selected from different livestock markets and farms covering 1. Gamboru kasuwa, 2. Large Animal Clinic University of Maiduguri Veterinary Teaching Hospital (VTH), 3. Kasuwan shanu, 4. Bulumkutu kasuwa, 5. Ngomari, 6. Sabon Gari and 7. Gwange in Maidugui, Borno State, Nigeria were examined and faeces and ticks collected within the period of June 2023 to November 2023.

### SAMPLE COLLECTION AND ANALYSIS

### TICK COLLECTION

Apparently healthy cattle of various breeds and sexes were sampled with consent from the cattle owners. During sample collection, every effort was made to reduce the animals' level of suffering. With the assistance of the herdsmen, the sampled cattle were securely restrained which made it simpler to reach all of the cattle's body parts. To prevent mutilation, ticks were plucked with gloved hands and then carefully twisted 180 degrees. Samples were collected and properly labelled and categorized on the basis of breed, sex, age of the cattle, as well as the date and location of sample collection. Collected tick samples were put into clean, properly labelled and well-capped glass vials containing 70% alcohol and 5% glycerol for preservation. The vials were then transported to the Parasitology Research Laboratory, Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine University of Maiduguri, Borno State for further identification and analysis.

### FAECAL SAMPLE COLLECTION

Faecal samples were collected from cattle using disposable hand gloves from the rectum via careful stimulation of the rectum with the fingers**.** Collected samples were properly labelled, data pertaining to the species and consistency of the faeces were recorded**.** The collected faecal samples were preserved in an ice-packed (flask) plastic container. Samples were transported directly to the Parasitology Research Laboratory, Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, University of Maiduguri Borno State, for analysis on the same day of sampling.

### LABORATORY PROCEDURE

Flotation method of fecal analysis was used. Fecal sample weighing 3g was suspended in 30 ml of saturated salt solution using spatula**.** It was thoroughly mix with pestle and mortar. The mixture was sieved and collected in a beaker and used to fill the sample bottle. The bottle was then covered with a cover slip for 4 to 5 minutes. The cover slip was placed on clean glass slide under a light microscope for examination. The slides were viewed using 10x objective lens following standardized procedures (Hayat *et al*., 1996). The results were appropriately recorded.

Additionally, the ticks were viewed, identified and recorded accordingly, using stereo-microscope**.** Identification of the different species of the ticks was accomplished with the help

of the anatomical and morphological characteristics as described by Soulsby (1982).

**RESULTS**

In Table I the total of 1585 samples for ticks and feces, consisting of 312 fecal (19.7%) and 1273 (80.3%) tick samples were collected from 312 cattle from various locations in Maiduguri metropolis.

**TABLE I: SAMPLE TYPES AND NUMBER OF SAMPLES COLLECTED**

| Sample | Frequency | Percentage (%) |
|---|---|---|
| Fecal | 312 | 19.7 |
| Tick | 1273 | 80.3 |
| Total | 1585 | 100 |

Table II shows the various locations within Maiduguri metropolis that 312 fecal samples were collected. Almost half the total samples were collected from Kasuwan Shanu (49.03%) and the rest of the 59.97% was collected from the other six locations.

Table III shows the prevalence of Gastro-intestinal helminth infections of cattle by breed, this result showed that all the breeds of cattle tested positive to different parasitic stages of various gastrointestinal helminths at varying percentages that ranges between 30.0% - 76.0%. The result showed that 63.7% of the total samples collected test positive.

Table IV shows the prevalence of gastrointestinal helminth infection of cattle by age. This table shows the infection rates in cattle ranging from 0>24 months of age. The table shows that 0<12 Months had a higher percentage of infection 67.57% compared to 12months>24 months.

Table V shows the prevalence of gastrointestinal helminth infection of cattle by sex. This table showed the prevalence of gastrointestinal helminths in male and female as 75.0% and 59.6% respectively.

Table VI shows prevalence of gastrointestinal helminth infection of cattle by their fecal consistency, the prevalence of gastrointestinal helminth infection is seen to decrease from watery (81.5%) to firm (42.2%).

**TABLE IV: PREVALENCE OF GASTROINTESTINAL HELMINTH INFECTION OF CATTLE BY AGE**

| Ages | Positive samples | Total | Prevalence (%) |
|---|---|---|---|
| 0<12 Months | 50 | 74 | 67.57 |
| 12-24 months | 79 | 120 | 65.83 |
| >24 months | 70 | 118 | 59.32 |

**TABLE II: LOCATION AND NUMBER OF FECAL SAMPLES COLLECTED PER SITE**

| Locations | Number of samples collected | Percentage (%) |
|---|---|---|
| Kasuwan shanu | 153 | 49.03 |
| Bulumkutu | 35 | 11.22 |
| Unimaid | 5 | 1.60 |
| Gwange | 29 | 9.29 |
| Gamboru | 44 | 14.1 |
| Ngomari | 25 | 8.01 |
| Sabon gari | 21 | 6.73 |

Incidence of gastrointestinal helminth infection is seen to be lowest under the intensive management (45.0%) and highest under the extensive system (69.43%).

Table VIII shows the ticks collected on the various breeds of cattle with the Red Bororo having the highest (336/26.3%) while the Bunaji had no tick on it during the course of the study. Table IX shows the sex of the cattle and the total number of ticks collected on them.

Table X shows the sex of the tick; total number of male (484/38.0%) ticks were less than females (789/61.9%) ticks.

**TABLE V: PREVALENCE OF GASTROINTESTINAL HELMINTH INFECTION OF CATTLE BY SEX**

| Sex | Positive samples | Total samples | Prevalence (%) |
|---|---|---|---|
| Males | 126 | 168 | 75.00 |
| Females | 73 | 144 | 50.69 |

**TABLE VI: PREVALENCE OF GASTROINTESTINAL HELMINTH INFECTION OF CATTLE BY FECAL CONSISTENCY**

| Fecal consistency | Positive samples | Total samples | Prevalence (%) |
|---|---|---|---|
| Watery | 93 | 114 | 81.58 |
| Pasty | 61 | 92 | 66.30 |
| Firm | 45 | 106 | 42.45 |

**TABLE III: SHOWING THE PREVALENCE OF GASTROINTESTINAL HELMINTH SPECIES INFECTION OF CATTLE BY BREED**

| S/n | | | | Types of Fecal Eggs | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Breed of cattle | PS | TS | Strg | Taeni | Strdes | Dicroc | Monie | Prevalence (%) |
| **1.** | Red Bororo | 23 | 40 | 15 | 03 | 02 | 01 | 02 | 57.50 |
| **2.** | Wadara | 73 | 96 | 40 | 05 | 28 | 00 | 00 | 76.04 |
| **3.** | Adamawa Gudali | 13 | 23 | 05 | 02 | 02 | 00 | 04 | 56.52 |
| **4.** | Abore | 29 | 45 | 08 | 06 | 00 | 05 | 10 | 64.44 |
| **5.** | Bokoloji | 39 | 59 | 21 | 00 | 11 | 00 | 07 | 66.10 |
| **6.** | Ndama | 19 | 39 | 19 | 00 | 00 | 00 | 00 | 48.72 |
| **7.** | Bunaji | 03 | 10 | 03 | 03 | 00 | 00 | 00 | 30.00 |
| | Total | 199 | 312 | 111 | 19 | 43 | 06 | 23 | 63.78 |

**P.S- Positive samples; T.S- Total sample; Strg- Strongylus; Taen- Taenia; Strdes- Strongyloides; Dicro- Dicrocelium; Monie- Monienza**

**TABLE VII: SHOWING PREVALENCE OF GASTROINTESTINAL HELMINTH INFECTION BY THE TYPE OF MANAGEMENT OF THE CATTLE**

| Type of management | Positive samples | Total samples | Prevalence (%) |
|---|---|---|---|
| Intensive | 27 | 60 | 45.00 |
| Semi intensive | 63 | 95 | 66.32 |
| Extensive | 109 | 157 | 69.43 |

**TABLE VIII: TYPES OF TICKS RECORDED BY SEX AND BREED OF ANIMALS**

| Breed | Types of ticks | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Hyalomma | | Boophilus | | Amblayo. | | |
| | M | F | M | F | M | F | |
| Red Bororo | 91 | 173 | 21 | 25 | 07 | 19 | 336 |
| Wadara | 44 | 101 | 30 | 13 | 04 | 15 | 207 |
| Adam. G. | 68 | 93 | 21 | 19 | 00 | 21 | 222 |
| Abore | 76 | 81 | 21 | 21 | 00 | 15 | 214 |
| Bokoloji | 77 | 97 | 20 | 09 | 02 | 12 | 217 |
| Ndama | 22 | 38 | 03 | 06 | 00 | 08 | 77 |
| Bunaji | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| Total | 378 | 583 | 116 | 93 | 13 | 90 | 1273 |

**TABLE IX: SEX OF ANIMALS AND NUMBER OF TICKS COLLECTED**

| S/n | Sex of animal | Number of ticks collected |
|---|---|---|
| 1 | Male cattle | 484 |
| 2 | Female cattle | 789 |
| 3 | Total | 1273 |

**TICKS**

A total of 1,273 ticks were collected from the same 312 cattle. The ticks where viewed, identified and recorded using stereo microscope. The breed of cattle from which ticks were collected are as follows:

Red Bororo, Wadara, Red Adamawa Gudali (Rahaji), Abore, Bokoloji, Ndama, Bunaji

**TABLE X: TYPES OF TICKS RECORDED BY SEX**

| Type of ticks | Hyalomma | | Boophilus | | Amblyoma | | Total |
|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | |
| Ticks collected | 378 | 583 | 93 | 116 | 13 | 90 | 1273 |
| Total | 961 | | 209 | | 103 | | 1273 |

**DISCUSSION**

This study revealed a total prevalence of 63.78% in cattle of different breeds. Wadara breed had the highest prevalence of gastrointestinal helminth (76.04%). The least prevalence was seen in Bunaji breed (30%). The higher prevalence seen in wadara breeds in this study could be as a result of more exposure of this breed to the parasites or it could be as a result of less resistance of the breeds to gastro intestinal helminths. Our findings contradict the findings by Adedipe *et al*. (2014) and Yuguda *et al*. (2018) who both reported higher prevalence rates of 46% and 74.8% respectively in White Fulani breed as compared to Wadara.

Squire *et al*. (2013) also found N'Dama breeds to have highest prevalence in Southern Ghana. The variations in breed prevalence could be credited to varying geographical locations, management systems and availability of suitable micro-environment for sustained survival and development of infective stage of most parasites. The differences in breed prevalence in the current study, revealed that breed may play a role in the prevalence of gastrointestinal helminth parasites. This finding agrees with the reports of Bisimwa *et al.* (2014) of exotic cattle breeds being 4.6 times more likely to be infected with gastrointestinal helminth parasites in Congo.

The fecal infection rate (67.57%) by gastrointestinal helminth is highest among cattle less than 12 months old. The least gastrointestinal helminth fecal infection prevalence (59.32%) was seen in the cattle above 24 months old. But there is no any statistically significant association among the ages of the cattle as P=0.4288. The findings agree with Ahmed *et al.* (2017), it was stated by these authors that the younger cattle are more susceptible than adult animals. The higher prevalence in younger cattle maybe due to undeveloped immune system, and regular exposure to infected cattle, but these findings contradict with the study by Khan *et al.*, (2021) who reported that adult cattle were highly affected by gastrointestinal parasites.

Based on sex, the overall prevalence of gastrointestinal helminth parasites was higher in males (75%) as compared to the females (50.69%). This finding is consistent with those of Bisimwa *et al*. (2014) in South Kivu Province of Congo and Yuguda *et al.* (2018) in Bauchi State of Nigeria. However, the findings were in contrast to Regassa *et al*. (2006) in Western Oromia, Ethiopia; Squire *et al.* (2013) in Southern Ghana. The high prevalence rates observed in males could be attributed to the fact that male cattle have aggressive habit of feeding as compared to female, it may also be as a result of contact of male animals to different females due to mating as males can have more than five contact with different females just for mating purpose. The studies carried out by Bisimwa *et al*. (2014) in South Kivu Province of Congo and Yuguda *et al.* (2018) in Bauchi state of Nigeria, is consistent with our findings. But, Adedipe *et al*. (2014) revealed that both female and male cattle could have the same chances of being infected with gastrointestinal parasites.

Prevalence in treated cattle was 36.71% and untreated cattle was 83.12%, while in cattle with unknown history the prevalence was 65.15%. Our finding is closely similar with the result of Gunathilaka *et al*. (2018) who reported prevalence of 46.67% in untreated and 15% treated cattle. The higher prevalence of these parasites in the untreated is justifiable because the treated cattle might have been infected but when treated are either totally free from the helminth or have a reduced burden of the parasites which the immune system of the cattle can handled there by leading to low prevalence in such category of cattle.

Cattle with watery faeces had the highest prevalence (81.58%) of gastrointestinal helminth infection. While the cattle with normal firm faeces had the lower prevalence gastrointestinal helminth infection (42.45%) as compared with those with watery faeces. Statistically $P<0.05$ which showed that there is very a high significant statistical association of the prevalence of these helminthes to the fecal consistency of the cattle. This finding disagrees with Bisimwa *et al.* (2018) who observed that not all parasitic helminths of cattle were associated with diarrhoea and anaemia.

Base on management system, higher prevalence (45.00%) of gastrointestinal helminth infection was seen in cattle under extensive management system as compared to those cattle under intensive system of management (42.45%).

The result of this study shows a high tick infestation among the cattle sampled. However, our finding shows a higher tick burden on female animals as compared to males which is consistent with previous studies carried out in ruminants Iqbal, *et al*. (2014) but in contrast to Musa *et al* 2014 working in Maiduguri. The result from this study may be because male animals receive more care mainly due to their use for draught and breeding purposes throughout the year, like frequent grooming including the manual removal of ticks, which would result in low tick burdens.

The findings in this study identified Hyalomma, Boophilus and Amblyomma species of hard ticks infesting cattle is in line with the work of Musa *et al.,* 2014 who had similar findings in Maiduguri, and these ticks are vectors of livestock and haemoparasitic diseases. Soulsby (1990) reported that the cuticle of hard ticks is key to survival in areas of high temperature, these hard ticks were predominant on cattle this could be as a result of the high ambient temperature which makes survival of soft ticks unfavourable in the region (Opara and Ezeh, 2011). The distribution of the ticks among the breeds Red Bororo, Wadara, Red Adamawa Gudali (Rahaji), Abore, Bokoloji, Ndama with exception of Bunaji shows that these ticks are not host specific in cattle

and needs blood meal for survival. The exception of Bunaji is attributed to the number, the management system and care under which was reared. The highest quantity of ticks found on Red Bororo which is in contrast to (Opara and Ezeh, 2011) findings is attributed to probably the management system (pastoralist) and the number sampled, because these breeds are common in this region. The ticks were highest around the preputial area (genitalia), then udder, flank and legs were the most tick infested area on cattle agreeing with Musa *et al.,* 2014. Asmaa *et al.* (2014) also reported that the preputial area and udders were the highly infested areas in cattle. These findings could be attributed to the fact that external genitals, udder, perineum and inguinal/groin region of the body are highly supplied with blood and this region is usually warmer as compared to the other areas of the body and also ticks usually prefer thinner and short hair skin for infestation.

There was higher infestation in the younger cattle than the older ones in this study and this is consistent with the work of Manan *et al.,* 2007 and Musa *et al.,* 2014, this could be attributed to the resistances against tick infestation as the animal gets older. Sajid *et al.,* 2007 attributed it to lower immunity and softer and thinner skin of young animals that could aid in the penetration of mouthparts of ticks for feeding.

## CONCLUSION

The result of this study shows that helminth and tick co-infection is a serious problem to livestock owners in Maiduguri, Borno state. Therefore, helminthosis and tick infestation co-infecting cattle in Borno state presents a serious challenge to the livestock health and food security in the state, thus appropriate and adequate control strategies should be put in place to mitigate losses and enhance the quantity and quality of meat to Borno and its Nigeria in general.

## CONFLICT OF INTEREST

No conflict of interest was interest was involved.

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