Research Journal of Applied Sciences 9 (3): 126-132, 2014
ISSN: 1815-932X

Tick Infestations among Cattle in Minna Metropolis, Niger State, Nigeria

I.A.A. Ejima, M. Obayumi, I.K. Olayemi and M.C. Dangana
Department of Biological Sciences, Parasitology and/or Entomology Unit's,
Federal University of Technology (FUT), Minna, Niger State, Nigeria

Abstract: A survey was carried out among cattle reared in Minna Metropolis, Niger State for tick infestation for a period of 4 months (June to September 2012). A total number of 218 cattle were examined of which 140 (64.2%) were found infested. Three species of ticks were identified namely: *Amblyomma variegatum*, *Boophilus decolaratus* and *Hyalomma marginatum*. The overall geometric mean intensity was 1.05. Of these species, *A. variegatum* recorded the highest percentage abundance in bulls (17.7%) and cows (14.6%) in the month of June and July, respectively. There was however, no significant difference in the relative abundance between bulls and cows ($p>0.05$). Also there was no significant difference in prevalence of infestation between the two sexes ($p>0.05$). However, the highest (27.4%) abundance of *A. variegatum* occurred in Maikunkele ranch. Whereas the species with the least percentage abundance, *H. marginatum* recorded its lowest (8.1%) and highest abundance (8.9%) in Maikunkele and Tayi ranch, respectively. The scrotal and udder regions of the bulls and cows recorded the largest tick infestation, respectively. The lowest abundance of tick infestation of bulls (0.1%) and cows (0.7%) were recorded in the head and neck of the cattle, respectively. The high prevalence rate and intensity of tick infestation recorded in this research has serious economic implications since ticks inflict serious pathological effects on both cattle and humans.

Key words: Cattle, GMI, Minna Metropolis, percentage abundance, tick infestation

INTRODUCTION

Ticks are obligate ectoparasites of a variety of vertebrate hosts and are found worldwide in distribution (Parola and Raoult, 2010). The medical and economic importance of ticks has long been recognized due to their ability to transmit diseases to humans and animals (Rajput *et al*., 2006). These latter researchers also observed that the major losses caused by ticks are due to their ability to transmit protozoan, rickettsial and viral diseases of livestock which are of economic importance worldwide. Muahammad *et al*. (2008) also recognized ticks as the most important pests of cattle and other domestic species of tropical and subtropical countries, serving as vectors of pathogenic microorganisms such as protozoans (babesiosis, theileriosis), rickettsiae (anaplasmosis, erhlichiosis and typhus) and viruses (e.g., Kyasanur Forest Disease). They are haematophagous arthropods belonging to the Phylum: Arthropoda; Class: Arachnida; Order: Acari and three major Families viz: Ixodidae (hard ticks), Argasidae (soft ticks) and Nuttalleillidae (of which little is known about) are recognized with approximately 899 tick species (Mehlhorn and Armstrong, 2010). The world's Argasid tick fauna is divided into four genera, namely *Argas*, *Carios*, *Ornithodoros* and *Otobius* and they contain species of medical and veterinary importance whereas the world's Ixodid tick fauna consists of 241 species in the genus *Ixodes* and 442 species in the remaining genera. The major genera of cattle ticks include: *Amblyomma*, *Hyalomma*, *Ixodes*, *Rhipicephalus*, *Boophilus*, *Dermacentor*, *Haemasphysalis*, *Anocenter* (Dipeolu, 1985; Kabir *et al*., 2011; Ejima and Ayegba, 2011). The most important genera of hard ticks are *Amblyomma*, *Dermacentor*, *Haemaphysalis*, *Hyalomma*, *Ixodes*, *Rhipicephalus* and *Boophilus*. There are 129 species of *Amblyomma* ticks. They are characterized by long mouthparts and beautifully coloured ornamented scuta. Eyes are present in most species not housed in sockets. They are three-host ticks and are widespread in tropical and sub-tropical zones where they parasitize a wide variety of mammalian hosts, reptiles and amphibians. *A. variegatum* is the most important species of the African continent as it is well adapted to domestic livestock and has the widest distribution throughout tropical and sub-Saharan Africa. Boophilus ticks have short mouthparts. They are one-host ticks which take about three weeks to complete their life cycle on the host

Corresponding Author: I.A.A. Ejima, Department of Biological Sciences, Parasitology and/or Entomology Unit's, Federal University of Technology (FUT), Minna, Niger State, Nigeria

from unfed larva to engorged female, preferably on cattle (Jongejan and Uilenberg, 2004). They can cause skin irritation once they attach to a host for a blood meal. The research of Sangwan *et al.* (1995) showed that a tick can suck 0.8-2.0 mL of blood in 24 h and one female tick can suck blood more than thirty times her weight (70.0 mg) during engorgement.

In Nigeria, the research of Dipeolu and Adeyefa (1984) revealed that pre-oviposition and eclosion periods were similar in each of the tick species. They observed that moisture provided by light to moderate rainfall, makes oviposition successful while excessive moisture due to heavy rainfall had adverse effect on oviposition. In Minna which is a Northern part of the country, records (Nigerian Meteorological Agency (NIMET) Minna, 2007 to 2012) have shown that ranges in mean monthly minimum and maximum temperatures during the wet and dry seasons were 40°C and above and between 32 and 36°C, respectively. Ticks are also one of the major vectors of pathogens such as *Babesia*, *Theileria*, *Anaplasma* species (Aktas *et al*., 2004); water disease, louping ill and viral encephalomyelitis to animals in the world (Soulsby, 1982; Dreyer *et al*., 1998). Aktas *et al.* (2004) recorded the mean number of infected *Hyalomma* species of ticks in male (mean = 11.3) and female (mean = 22.4), collected from cattle with *Theileria* species of protozoan pathogen in east Turkey and observed that prevalence and intensity of Theileria infection was greater in female ticks than males. Overall prevalence of tick infestations was recorded by various researchers working independently in different regions, ranging from 61.1-75.1%. In Nigeria, Adekunle *et al.* (2002) and Ejima and Ayegba (2011), recorded overall prevalence of 67.5 and 61.1%, respectively while Islam *et al.* (2009) recorded 65.5%; Rony *et al.* (2010) in *Bangladesh*, recorded 64.07% and Sajid *et al.* (2008), documented 75.1% tick infestation among cattle reared in Pakistan. Krutsay (1979) reported that ectoparasites infestation is one of the major veterinary problems affecting livestock industries in many parts of the world. Ticks act not only as potential vectors but also as reservoirs of certain infectious agents such as *Pasteurella multocida*, *Brucella abortus* and *Salmonella typhimurium* in man and animals (Jongejan and Uilenberg, 2004).

The research of Norval *et al.* (1989) showed that weight loss, hide quality and reduced milk production are direct consequences of ectoparasitism in domestic animals. Byford *et al.* (1992) stated that tick infestation affects appetite, body condition, blood composition and respiratory rate of the animals. In Australia alone in 1974, losses due to cattle tick (*Boophilus microplus*) were estimated to be US$ 62 million (Springell, 1983). Feeding by large number of ticks causes reduction in live weight and anaemia among domestic animals. Apart from irritation or anaemia in case of heavy infestation tick can cause severe dermatitis. These parasites generate direct effect in cattle in terms of milk production and reduce weight gain (L'Hostis and Seegers, 2002; Peter *et al*., 2005).

The systemic effects of a tick bite can be extremely serious. Many species of tick can cause debilitating or even fatal paralysis in their hosts. The most potent cause of tick paralysis is Ixodes holocyclus, found along the east coast of Australia (Camphell, 2005; Mehlhorn and Armstrong, 2010). In North America, *Ixodes pacificus*, *D. variabilis* and *D. andersoni* have all been reported to cause tick paralysis in companion animals and humans. Worldwide, tick parasitism and tick borne diseases cost the livestock industry >US$ 7 billion, mostly due to losses to cattle. The most serious losses are due to two tick-borne diseases caused by protozoan parasites of the genera *Babesia* and *Theileria* (Sonenshine, 2002).

Livestock production is a source of employment and livelihood in Nigeria agriculture. A large percentage of rural people of this country satisfy their subsistence needs through livestock production. It involves rearing and marketing of livestock which includes mainly cattle, sheep, goats, pigs, camels and poultry but the cattle are the most prominent of all domestic animals in Nigeria (Tewe, 1997). Pests and diseases are the greatest threats to the realization of the productivity potentials of the cattle herds in Nigeria amongst which ticks constitute 80% of the infections and diseases (Adekunle *et al*., 2002). The research of these latter researchers in three States in Nigeria, viz Kano, Kogi and Niger revealed percentage prevalence of ticks among cattle of 67.5%.

Heavy infestation of ticks causes severe irritation which makes the animals to rub and scratch the skin that might result in loss of hairs. Tick bite causes discomfort and damages to the hides and skin which constitute one of the most profitable raw materials in Nigeria used in making bags, shoes, wristwatches, mats and leather clothes leading to loss of these materials. Too often cattle rearers tend to regard tick infestation as a minor problem of cattle but it is really a serious problem. This study was undertaken to determine the prevalence and intensity of infestation of ticks on cattle reared in Minna Metropolis, Niger State. The baseline data generated from this research would be useful for providing appropriate preventive measures against the multiple, debilitating zoonotic infections transmitted by ticks in Minna Metropolis.

MATERIALS AND METHODS

Study area: The study area is within Minna Metropolis which is the capital of Niger State in Nigeria, located within longitude 09°07"N and 06°44"E at an altitude of about 1,200 m above sea level. During the study, two sites were selected; the collection sites were about 4500 m apart. Each study was designated as A and B, respectively corresponding to cattle rearers' settlements. These sites were selected due to their proximity and availability of cattle. Site A is a cattle ranch, located in Tayi Village, along Bosso Road while site B is another ranch in U/Hausawa, old road in Maikunkele.

Study population, duration and collection of ticks: The study was carried out in each site for 16 weeks between the months of June and September 2012 in order to determine the prevalence and intensity of tick infestations on cattle reared in Minna metropolis. Time fixed for collection was between 6:00-8:00 am (for site A) and between 7:10-8:30 am (for site B). Ticks were collected from all parts of the body of the cattle ranging from head, ear, chest, udder, belly, scrotum, neck, leg, hoof, arm, tail to anal region. Cattle were randomly examined and ticks were collected by handpicking. Biological data of cattle were recorded including sex of the cattle. Ticks were preserved in 10% formaldehyde in specimen bottles with date and sites of collection.

Tick identification: Presumptive identifications were made before preserving in 10% formaldehyde at the sites of collection using hand lens and final identifications were made under compound microscope according to keys and description given by Hoogstraal and Kaiser (1959). Briefly, the guiding keys to the identification of ticks are based on the features of the three major Families viz.; Argasidae, Ixodidae and Nuttalliellidae; life cycle of members of these families, i.e., stages of development (larva, nymph and adult and whether it is one, two or three host species). Morphological features such as nature of capitulum and its position with respect to dorso-ventral or terminal aspect of the organism, presence of smooth or striated scutum, eyes, festoons and pulvili are useful guide for identification. Hard ticks often have eyes, festoons and pulvilli on legs; these are normally armed with internal and external spurs. Soft ticks on the other hand, often have wrinkled and soft back with the capitulum visible only ventrally.

Statistical analysis: The results obtained were analyzed statistically for significant differences in the prevalent rates and intensity (GMI) of tick infestation by sex.

Chi-square statistic was used to compare prevalent rates while Wilcoxon (1945) paired sample test (t) was employed for testing differences in intensity of infestation among sexes and location of sample collections.

RESULTS AND DISCUSSION

Table 1 shows the monthly prevalence (%), percentage abundance and mean distribution of hard ticks by sex among cattle reared in Minna Metropolis. The three species of hard ticks (Family: Ixodidae) encountered among cattle examined include *A. variegatum*, *B. decoloratus* and *H. marginatum* (Fig. 1-3). Of these three species encountered during the survey, *Amblyomma* sp. exhibited the highest abundance among the bulls (♂) with the percentage abundance of 11.2, 17.7, 9.3 and 11.1% in the months of June, July, August and September, respectively.

Also, the cows surveyed recorded *Amblyomma* sp. as the highest abundant species of tick with percentage abundance of 14.6, 13.3, 14.3 and 12.8% recorded in the months of June, July, August and September, respectively. There was however, no significant difference in the level of abundance between bulls and cows ($p>0.05$; $\chi^2_{cal} = 1.653$; df = 2). Likewise, in both sexes, there was no significant difference in the prevalence of infestation ($p>0.05$; $\chi^2_{cal} = 0.391$; df = 2). In both sexes, the highest relative abundance of tick infestations occurred in the month of July compared to other months. The highest (9.4/8.5) and the lowest (7.0/7.4) percentage abundance of *B. decoloratus* were recorded for bulls/cows in the month of July and June, respectively. Whereas the highest abundance of *H. marginatum* (4.9) in bulls occurred in the months of June and September, respectively while the highest abundance (5.7) of the same species of tick (*H. marginatum*) was recorded for cows in the months of June. However, the lowest abundance of *H. marginatum* (3.7/2.9) recorded for both sexes of cattle were in July (Table 1).

Pooled data of monthly hard tick infestation among cattle in Minna Metropolis: Table 2 shows the overall prevalence (64.2%) and Geometric Mean Intensity (GMI) of 1.05 of hard ticks among cattle in Minna. The results showed the monthly percentage abundance of 25.5, 25.3, 23.5, 25.7 of ticks collected for the month of June, July, August and September, respectively. The highest intensity recorded here was in the month of September with GMI of 1.21.

The prevalence of 70.8, 71.7, 68.1 and 49.2 were recorded for the months of June, July, August and September, respectively. There was however, no

Table 1: Monthly prevalence (%), percentage abundance and Mean (GMI) distribution of hard ticks (*Amblyomma variegatum*, *Boophilus decoloratus* and *Hyalomma marginatum*) in males and female cattle reared in Minna Metropolis

Months of collection	No. of cattle sampled bulls/cows	No. of +ve bulls/cows	Hard ticks collected: Prev. (%) bulls/cows	Hard ticks collected: No. of ticks collected bulls/cows	Percentage abundance bulls/cows	GMI bulls/cows
June	24/24	18/16	75.0/66.7	Amb 75/102	11.2/14.600	1.91/2.15
				Booph. 47/52	7.0/7.4000	
				Hyalo. 33/40	4.9/5.7000	
July	29/31	21/22	72.4/71.0	Amb 118/93	17.7/13.300	1.77/1.65
				Booph 55/34	8.2/4.9000	
				Hyalo. 25/20	3.7/2.9000	
August	26/21	19/13	73.1/61.9	Amb 62/100	9.3/14.300	1.83/2.45
				Booph 56/55	8.4/7.9000	
				Hyalo. 27/21	4.0/3.0000	
September	27/36	14/17	51.9/47.2	Amb 74/89	11.1/12.800	2.35/2.03
				Booph 63/59	9.4/8.5000	
				Hyalo. 33/33	4.9/4.7000	
Total	106/112	72/68	67.9/60.7	668/698	100.0/100.00	1.09/1.10

There was no significant difference in prevalence of tick infestation between bulls (♂) and cows (♀) ($p>0.05$) ($\chi^2_{cal} = 0.391$; $\chi^2_{tab} = 0.05$; df (2) = 7.815). There was also no significant difference in intensity of tick infestation between bulls (♂) and cows (♀) ($p>0.50$); ($T_{cal} = 4$; $T_{tab.}$ df = 4 = 2); Amb: *Amblyomma variegatum*; Booph: *Boophilus decoloratus*; Hyalo: *Hyalomma marginatum*

Table 2: The overall prevalence (%) and Geometric Mean Intensity (GMI) of hard ticks among cattle reared in Minna Metropolis

Species of ticks and months of collection	*Amblyomma variegatum*, *Boophilus decoloratus* and *Hyalomma marginatus*: No. of cattle examined	No +ve	Prev. (%)	No. of ticks collected (%)	GMI
Months					
June	48	34	70.8	349 (25.5)	1.19
July	60	43	71.7	345 (25.3)	1.15
August	47	32	68.1	321 (23.5)	1.20
September	63	31	49.2	351 (25.7)	1.21
Total	218	140	64.2	1366 (100.0)	1.05

No significant difference in prevalence of tick infestation between male (bulls) and female (cows) cattle examined ($p>0.05$)

Fig. 1: *Amblyomma variegatum*

Fig. 2: *Hyalomma marginatum*

Fig. 3: *Boophilus decoloratus*

significant difference in the prevalence level of tick infestation from June to September. There were slightly higher GMI (1.21 and 1.20) recorded for the months of September and August than June and July (Table 2).

The mean distribution of hard ticks in different body parts of cattle reared in Minna Metropolis. The mean distribution of hard ticks (*A. variegatum*, *B. decoloratus* and *H. marginatum*) in different body parts of the cattle reared in Minna is shown in Table 3. Of these species of hard ticks, the results showed that *Amblyomma* sp.

Table 3: Prevalence (%) and mean distribution of hard ticks (*Amblyomma variegatum*, *Boophilus decoloratus* and *Hyalomma marginatum*) from different body parts of male cattle sampled in Minna Metropolis

Different parts of cattle sampled	No. of cattle sampled	No. of cattle affected	Hard ticks No. of ticks collected	Percentage abundance
Anal region	106	40	Amb. 89	13.30
			Booph. 56	8.38
			Hyalo. 25	3.70
Belly	106	30	Amb. 36	5.39
			Booph. 35	5.20
			Hyalo. 11	1.60
Leg	106	18	Amb. 24	3.59
			Booph. 17	2.50
			Hyalo. 6	0.90
Ear	106	10	Amb. 11	1.60
			Booph. 4	0.60
			Hyalo. 1	0.10
Tail	106	13	Amb. 16	2.40
			Booph. 14	2.10
			Hyalo. 6	0.90
Hooves	106	14	Amb. 30	4.49
			Booph. 15	2.20
			Hyalo. 16	2.40
Scrotal region	106	40	Amb. 98	14.70
			Booph. 72	10.80
			Hyalo. 50	7.48
Arm	106	8	Amb. 17	2.50
			Booph. 5	0.70
			Hyalo. 3	0.40
Eye	106	2	Amb. 4	0.60
			Booph. 0	0.00
			Hyalo. 0	0.00
Neck	106	4	Amb. 3	0.40
			Booph. 1	0.10
			Hyalo. 2	0.30
Head	106	1	Amb. 1	0.10
			Booph. 0	0.00
			Hyalo. 0	0.00
Total	106	72	668	100.00

Amb: *Ambyomma variegatum*; Booph: *Boophilus decoloratus*; Hyalo: *Hyalomma marginatum*

exhibited the highest relative abundance all over the eleven body parts examined among bulls. The highest percentage abundance of 14.7% was recorded for the scrotal region while the lowest 0.1% was recorded for the head region for *Amblyomma* sp., respectively. *Boophilus* sp. and *Hyalomma* sp. recorded 0.0% percentage abundance in the eye and head regions, respectively.

The highest relative abundance of *A. variegatum* was recorded among cows (♀) with percentage abundance of 35.4% at the udder region while *H. marginatum* exhibited 0.0% at the arm region. In both sexes of cattle, the highest percentage abundance of ticks occurred in the scrotal region for males (bulls: 14.7%) and udder region for females (cows: 35.4%), respectively (Table 4 and Fig. 1).

The percentage prevalence and percentage abundance of hard tick species among cattle in different localities in Minna Metropolis: Of the three species of hard ticks, *Amblyomma* sp. also exhibited the highest percentage abundance of 24.8 and 27.4% for Tayi and Maikunkele Ranches, respectively (Table 5).

Table 4: Prevalence (%) and mean distribution of hard ticks (*Amblyomma variegatum*, *Boophilus decoloratus* and *Hyalomma marginatum*) from different body parts of female cattle sampled in Minna Metropolis

Different parts of cattle sampled	No. of cattle sampled	No. of cattle affected	Hard ticks No. of ticks collected	Percentage abundance
Anal region	112	39	Amb. 53	7.6
			Booph. 31	4.4
			Hyalo. 19	2.7
Belly	112	34	Amb. 40	5.7
			Booph. 28	4.0
			Hyalo. 15	2.1
Leg	112	12	Amb. 5	0.7
			Booph. 5	0.7
			Hyalo. 2	0.3
Ear	112	9	Amb. 9	1.3
			Booph. 2	0.3
			Hyalo. 1	0.1
Tail	112	14	Amb. 9	1.3
			Booph. 7	1.0
			Hyalo. 5	0.7
Hooves	112	12	Amb. 8	1.1
			Booph. 3	0.4
			Hyalo. 8	1.1
Udder	112	39	Amb. 247	35.4
			Booph. 120	17.2
			Hyalo. 68	9.7
Neck	112	2	Amb. 3	0.4
			Booph. 0	0.0
			Hyalo. 2	0.3
Arm	112	6	Amb. 4	0.6
			Booph. 4	0.6
			Hyalo. 0	0.0
Total	112	68	698	100.0

Amb: *Ambyomma variegatum*; Booph: *Boophilus decoloratus*; Hyalo: *Hyalomma marginatum*

Table 5: Percentage prevalence and percentage abundance of hard tick sp. (*Amblyomma variegatum*, *Boophilus decoloratus* and *Hyalomma marginatum*) among cattle in different localities in Minna Metropolis

Locality from Minna Metropolis	No. of cattle sampled	No. +ve	Percentage prev.	No. of ticks collected	Percentage abundance
Tayi abbatoir (Bosso)	95	66	69.5	Amb. 339	24.8
				Booph. 210	15.4
				Hyalo. 121	8.9
Maikunkele abbatoir (U/Hausawa)	123	74	60.2	Amb. 374	27.4
				Booph. 211	15.4
				Hyalo. 111	8.1
Total	218	140	64.2	1366	100.0

There was no significant difference in tick abundance among cattle with respect to the two localities (ranches) surveyed ($p>0.05$); Amb: *Ambyomma variegatum*; Booph: *Boophilus decoloratus* and Hyalo: *Hyalomma marginatum*

Of the 218 cattle examined, 140 (64.2%) were found infested with one or more species of ticks and this falls within the common range of overall prevalent levels (61.1-75.1%) of tick infestations in cattle in other regions of the world. The findings of this study agree with those of Adekunle *et al.* (2002) in Nigeria and that of Rony *et al.* (2010) in Gazipur, Bangladesh who recorded 67.5 and 64.07%, respectively of tick infestation. Similar observation was made by Islam *et al.* (2009) who recorded 65.5% of tick infestation in Siranjganj. In the present research, *A. variegatum*, *B. decoloratus* and *H. marginatum* have been identified to be prevalent in

Minna Metropolis. Similar observations were made by Ejima and Ayegba (2011) in Idah LGA, Nigeria who reported the prevalence (61.6%) of hard ticks (*A. variegatum*, *B. decoloratus* and *R. sanguineus*). The study attributed the prevalence of Ixodid ticks to favourable climatic conditions such as moisture provided by light and moderate rainfall. In the same vein, the high prevalence of ticks recorded in this research could be due to similar favourable climatic conditions in Minna Metropolis (NIMET 2007-2012). In contrast to the findings of Kabir *et al*. (2011), *B. microplus* was the most widespread and most common cattle tick in different Upazila of Chittagong District Bangladesh, *A. variegatum* was the most common in Minna Metropolis but more comprehensive survey would be required to confirm this observation for this region. The highest percentage abundance of *Amblyomma* species recorded for both sexes of cattle in this research was to be expected 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. The findings of this study differ with the earlier findings of some other scientists. Higher prevalence (75.1%) in cattle was reported by Sajid *et al*. (2008) in Pakistan and this result is significantly higher than the result recorded in this research. The difference among the results of present and earlier study might be due to variation in geographical locations and climatic conditions of the surveyed areas/regions.

The highest percentage abundance (14.7%) and (13.3%) recorded among bulls was at the scrotal and anal regions. In the same vein, the highest percentage abundance (35.4%) and (7.6%) recorded among cows was at the udder and anal regions, respectively. This findings was in agreement with that of Mehlhorn and Armstrong (2010) who stated that when a suitable host is detected, the tick adopts a questing posture, waving the first pair of legs in the air while it moves itself into a suitable position to crawl onto the host and then moves round to a suitable feeding location where it uses its chelicerae to cut through the skin and then inserts the hypostomes into the wound which anchors the tick with recurved teeth causing damage to the scrotum/udder and skin. The higher percentage abundance of ticks at anal, udder and scrotal regions compared to other parts of the body (which are usually covered with thick fur) may be due to more or less bare nature of these regions thus exposing the skin and making blood readily available for ticks as blood suckers (Ejima and Ayegba, 2011). The lowest intensity of tick infestation as recorded in the head and neck of the cattle may be due to the fact that these body parts are covered with thick fur. The infestation of ticks in Maikunkele ranch was higher than that of Tayi ranch, probably because the vegetation and dirty environment where the ticks thrive are more readily available in that area than in Tayi. The high prevalence rate of tick infestation recorded in this research has serious economic implication as it inflict pathological effects on both cattle and humans. Therefore, some control measures should be undertaken by the government and cattle rearers should also be educated about the endemic nature of ticks.

CONCLUSION

This research has revealed that the hard ticks (Family: Ixodidae), comprising of three species namely; *A. variegatum*, *B. decoloratus* and *H. marginatum* were prevalent in Minna Metropolis. The overall prevalence of infestation (64.2%) and overall geometric mean intensity (1.05) were recorded. However, the soft ticks (Family: Argasidae) were not encountered in this study.

RECOMMENDATIONS

Having established high rate of tick infestation among cattle reared in Minna Metropolis, the following recommendations were made: more elaborate survey of tick infestation should be carried out in Minna Local Government Area (LGA) as whole and its environs to establish the level of prevalence and intensity of tick infestation; the necessary control measures should be put in place by the cattle rearers and the government and enlightenment of the Fulani cattle rearers to cooperate with researchers in this type of endeavour should be instituted so that appropriate solutions can be proffered.

ACKNOWLEDGEMENTS

Researchers are grateful to Dangana, Muhammed Chata, the Senior Technologist in Biology Laboratory of the Department for assistance rendered during the preparation of specimens collected. Researchers are also indebted to the young Fulani who assisted in immobilizing the cattle and hand-picking the ticks during the collection of samples.

REFERENCES

Adekunle, O.A., O.I. Oladele and T.D. Olukaiyeja, 2002. Indigenous control methods for pests and diseases of cattle in Northern Nigeria. Livest. Res. Rural Dev., Vol. 14.

Aktas, M., N. Dumanli and M. Angin, 2004. Cattle infestation by *Hyalomma* ticks and prevalence of*Theileria* in *Hyalomma* species in the east of Turkey. Vet. Parasitol., 119: 1-8.

Byford, R.L., M.E. Craig and B.L. Crosby, 1992. A review of ectoparasites and their effect on cattle production. J. Anim. Sci., 70: 597-602.

Camphell, R.L., 2005. Other External Parasites. In: Textbook of Veterinary Internal Medicine, Ethinger, S.J. and E.C. Fieldman (Eds.). 6th Edn., Mo Elsevier Saunders, St. Louis, pp: 66-70.

Dipeolu, O.O. and C.A. Adeyefa, 1984. Studies on ticks of veterinary importance in Nigeria. VIII. Differences observed in the biology of ticks which fed on different domestic animal hosts. Folia Parasitol., 31: 53-61.

Dipeolu, O.O., 1985. Studies on ticks of veterinary importance in Nigeria XII. Oviposition and eclosion in five species of IXODID ticks in contrasting habitats. Exp. Applied Acarol., 1: 45-62.

Dreyer, K., L.J. Fourie and D.J. Kok, 1998. Tick diversity, abundance and seasonal dynamics in a resource-poor urban environment in the free state Province. Onderstepoort. J. Vet. Res., 65: 305-316.

Ejima, I.A.A. and A.E. Ayegba, 2011. Relative abundance of hard tick on reared cattle (Family: Bovidae;*Bos* spp.) in Idah Local Government Area (LGA), Kogi State, Nigeria. Zoologist, 9: 9-16.

Hoogstraal, A.H. and M.N. Kaiser, 1959. Ticks (Ixodoidea) of Arabia, with special reference to the Yemen. Fieldiana, Zool., 39: 319-322.

Islam, M.S., S.A. Rahman, P. Sarker, Anissuzzaman and M.M.H. Mondal, 2009. Prevalence and population density of ectoparasitic infestation in cattle in Sirajgonj District, Bangladesh. Bangl. Res. Pub. J., 2: 332-339.

Jongejan, F. and G. Uilenberg, 2004. The global importance of ticks. Parasitology, 129: S3-S14.

Kabir, M.H.B., M.M.H. Mondal, M. Elijas, M.A. Mannan and M.A. Hashem *et al*., 2011. An epidemiological survey on investigation of tick infestation in cattle at Chittagong District, Bangladesh. Afr. J. Microbiol. Res., 5: 346-352.

Krutsay, M., 1979. Spread and detection of psoroptic scabies of cattle in the United States. J. Am. Vet. Assoc., 175: 1278-1280.

L'Hostis, M. and H. Seegers, 2002. Tick-borne parasitic diseases in cattle: Current knowledge and prospective risk analysis related to the ongoing evolution in French cattle farming systems. Vet. Res., 33: 599-611.

Mehlhorn, H. and P.M. Armstrong, 2010. Encyclopedic Reference of Parasitology. Springer Verlag, Berlin.

Muahammad, G., A. Naureen, S. Firyal and M. Saqib, 2008. Tick control strategies in dairy production medicine. Pak. Vet. J., 28: 43-50.

Norval, R.A.I., R.W. Sutherst, O.G. Jorgensen, J.D. Gibson and J.D. Kerr, 1989. The effect of bont tick (*Amblyomma hebraeum*) on the weight gain Afrikaner steers. Vet. Parasitol., 33: 329-329.

Parola, P. and D. Raoult, 2010. Ticks and tickborne bacterial diseases in humans: An emerging infectious threat. Clin. Infect. Dis., 32: 897-928.

Peter, R.J., P. Van den Bossche, B.L. Penzhorn and B. Sharp, 2005. Tick, fly and mosquito control: Lessons from the past, solutions for the future. Vet. Parasitol., 132: 205-215.

Rajput, Z.I., S.H. Hu, W.J. Chen, A.G. Arijo and C.W. Xiao, 2006. Importance of ticks and their chemical and immunological control in livestock. J. Zhejiang Univ. Sci. B, 7: 912-921.

Rony, S.A., M.M.H. Mondal, N. Begum, M.A. Islam and S. Afroze, 2010. Epidemiology of ectoparasitic infestations in cattle at Bhawal Forest Area, Gazipur. Bangl. J. Vet. Med., 8: 27-33.

Sajid, M.S., I. Iqbal, M.N. Khan and G. Muhammad, 2008. Point prevalence of hard ticks (Ixodids) infesting domestic ruminants of lower Punjab, Pakistan. Pak. Int. J. Agric. Biol., 10: 349-351.

Sangwan, A.K., M.B. Chchabra and S.S. Chaudbri, 1995. Status report on ticks and mites affecting domestic livestock in Haryana. Agric. Res. Karnal, 16: 117-127.

Sonenshine, D.E., 2002. Ticks. In: Encyclopedia of Pest Management, Pimentel, D. (Ed.). 10th Edn., Marcel Dekker, USA., ISBN-13: 9780824706326, pp: 450-455.

Soulsby, E.J., 1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7th Edn., Bailliere and Tindal, London, pp: 36-788.

Springell, P.H., 1983. The Cattle tick in relation to animal production in Australia. World Anim. Rev., 36: 1-5.

Tewe, O.O., 1997. Sustainability and Development: Paradigms from Nigeria's Livestock Industry. University of Ibadan, Ibadan, pp: 42.

Wilcoxon, F., 1945. Individual comparison by ranking methods. Biometrics Bull., 1: 80-83.