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Survey of Tick Infestation of Cattle at Four Selected Grazing Sites in the Tropics

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Abstract: Survey of tick infestation of cattle was studied at different communities of Nsukka district, Enugu State, Nigeria from November 2010 to October, 2011. The prevalence of ticks in relation to age, sex, breed, weight, season of the year and different body parts of the host was studied. A total of 139 cattles were examined, of which 123(88.49%) cattle were tick infested. Four species of tick were identified namely *Rhipicephalus* (*Boophilus) microplus*, *Amblyomma variegatum*, *Rhipicephalus* (*Boophilus) annulatus* and *Amblyomma maculatum*. The range of tick burden was 1 – 8 per four square inch of heavily infested area of Nsukka district. Mean tick burden was high in case of *R. (B.) microplus* (2.93±0.21), followed by *A. variegatum* (2.01±0.15), *R. (B.) annulatus* (0.74±0.08) and *A. maculatum* (0.25±0.04). Prevalence was significantly ($p<0.01$) higher in cattle of ≤ 2.0 years of age (96.66%) than in cattle of >2.0 years of age (48.94%). Infestation of tick was significantly higher ($p<0.01$) in males (73.27%) than in females (26.68%) cattle. Tick infestation was more prevalent in White Fulani (38.25%) cattle than in Sokoto Gudali (25.19%) cattle. Prevalence of tick infestation was significantly ($p<0.01$) higher in dry season (32.16%) than in west season (11.72%). Prevalence of ticks by body weight is significantly ($P<0.01$) higher in cattle with ≤ 299kg body weight (41.10%) than in cattle with > 299kg body weight (27.15%). Ticks were widely distributed in different parts of the host body such as armpit, inner thigh, penis, udder, mammary gland, scrotum and vulva, of which inner tigh (26.66%) was most infected, while vulva (10.80%) was the least infected animal body part. It was concluded that *R. (B.) microplus* is the main tick species identified which was a threat to the cattle population in Nsukka district, irrespective of age, sex, breed of the animal, Season of the year, weight of the animal of the study area.

Key words: Prevalence · Tick Survey · Cattle Infestation · *Rhipicephalus* (*Boophilus) microplus*. *Amblyomma variegatum* · *Rhipicephalus* (*Boophilus) annulatus* · *Amblyomma maculatum*

INTRODUCTION

Beef cattle in the tropics are exposed to varying levels of challenge from endo - and ecto - parasites to other environmental stressors. Among ectoparasites, ticks have been recognized as the most notorious threat to cattle, due to severe irritation, allergy and toxicosis [1]. Ticks are obligate ectoparasites of mammals, reptiles and birds and are of medical and veterinary importance [2]. The ticks bite causes discomfort and can lead to secondary infections, some species are capable of causing paralysis in animals and small children and ticks are vectors of a number of diseases affecting both animals and humans [3-5].

The livestock sector represents a significant part of the global economy, particularly in the developing world. Thus, livestock provides energy, food, raw materials and manure for crops. It is therefore not surprising that the livestock sector, especially the dairy sector, has emerged as an important economic source for a vast majority of the rural population and a target for agribusiness in dairy, meat and various other products in the processed food sector.

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Tick cause substantial losses in cattle production, in terms of diseases, reduced productivity and fertility and often death and are economically the most important ectoparasite of cattle [6].

The impact of ticks and tick borne diseases on the individual and national economics warrants application of appropriate tick control strategies on priority basis [7]. Most of the investigations on prevalence of tick species in Africa (Nigeria) are more than a decade old [8, 9], whereas periodical monitoring of tick infestation is an essential component for formulating effective control measures and recommendations. Therefore the present study was undertaken to determine the prevalence of ticks in relation to age, sex, breed, seasons of the year and weight of the cattle.

MATERIALS AND METHODS

Study Area and Period: The survey was conducted on two seasons viz: - dry (November – February 2011) and wet (April – October 2012) season at four selected grazing sites (Nsukka, Ikpa, Obukpa and Edem) within the Nsukka urban, Enugu State, Nigeria. Nsukka urban is located in derived savanna zone of Eastern Nigeria about 60 km northwest of Enugu. It is located between latitudes 6°44` and 7°00` north and longitudes 6°14` and 7°35` east and covers an area of about 475 m^2 bordered by Igbo-Eze North Local Government Area in the north, Igbo-Eze South, Uzouwani in the west, Igbo-etiti in the south and Isi-uzo and Udenu in the east [10].

The vegetation is of forest savanna mosaic characterized by two physiognomic and structural forms dominated by broad tree types and herbaceous graminoids. The dominant human activity in this area is agriculture. The major crops produced in the area are cassava, yam, cocoyam, grains etc; livestock rearing is pronounced.

Cattle: One hundred and thirty-nine cattle were selected randomly on the basis of sex, age and breed thus; Nsukka (36), Ikpa (36), Obukpa (34) and Edem (33) grazing sites. Three cows were randomly selected from each grazing site monthly except for Obukpa and Edem where lesser number of cows was selected. All cows were aged ≤ 2.0 year and > 2.0 years based on dentitions [11].

Ticks: Ticks were collected by hand picking from different body parts of the cattle without damaging their mouth parts [12]. Ticks were preserved in 70% ethyl alcohol in clean, well-stopped glass vials and labeled properly. Permanent mounts of the tick specimens were prepared following Soulsby [12]. Morphological characterization of ticks was carried out using a stereoscopic microscope [13-15]. Prevalence for each tick species was calculated as P ≤ d/n x 100, where p = the prevalence, d = the number of animals that tested positive for a particular tick species and n ≤ the total number of animals sampled [16].

Analysis: Age was determined by using the dentition of the animals [11] supported by oral evidence of the Fulani herdsmen, ages below and above two was used in convenience. Statistical analyses were carried out by using Statistical Package for Social Science (SPSS). Also to compare the prevalence of ticks of cattle, sexes, ages, breeds and seasonal data were analyzed by using either t-test or analysis of variance (ANOVA). Level of significance was set at $p<0.05$.

RESULTS AND DISCUSSION

During this study, a total of 139 cattle were examined of which 123 animals were found to be infested with different species of ticks. The research work revealed that about 88.49% cattle were found to be infested by tick of which *Rhipicephalus* (*Boophilus) microplus* 100 (49.2%), *Amblyomma variegatum* 83 (40.89%), *Rhipicephalus (Boophilus) annulatus* 15 (7.39%) and *Amblyomma maculatum* 5 (2.46%) were identified (Table 1).

Mean tick burden was high in *R.* (*B.) microplus* (2.93±0.21), followed by *A. variegatum* (2.01±0.15), *R.* (*B.) annulatus* (0.74±0.08) and *A. maculatum* (0.25±0.04) (Table 1). The high prevalence of *Rhipicephalus* (*Boophilus)* in this study has been severally reported for cattle elsewhere. Biu *et al*. [17] recorded tick species infesting ruminants from University of Maiduguri, Nigeria and reported an overall high prevalence of 64% with 39 (68.01%) for cattle, followed by 13 (20.31%) for sheep and 12 (18.75%) for goat. Furthermore, in their study, *Rhipicephalus* (*Boophilus*) species was observed to be most predominant with a prevalence of 56.1%, followed by *Hyalomma* spp. (43.9%). Olabode *et al*. [18] in a study on the occurrence, species composition and economic impact of tick in Buturu market Jos-Plateau, Nigeria, observed that 12.5% of cattle were infested by ticks of which *Rhipicephalus* (*Boophilus)* spp were most prevalent with 7.5%, followed by *Amblyomma* spp, (4.5%) and *Hyalomma* spp (3.0). Obadiah and Shekaro [19] recently reported four species of ticks from Zaria, Nigeria and showed that *R.* (*B.) microplus* was most predominant with

Table 1: Prevalence of ticks of cattle selected from grazing sites in Nsukka urban, Enugu State, Nigeria

Name of Ticks	Number of Cattle Infected (%) N = 139	Mean
Amblyomma maculatum	5(3.59)	0.25±0.04
Amblyomma variegatum	83(59.7)	2.01±0.15
Rhipicephalus (*Boophilus) annulatus*	15(10.8)	0.74±0.08
Rhipicephalus (*Boophilus) microplus*	100(71.9)	2.93±0.21
Total	123*(88.48)	2.85±0.19

N = total animals examined, * = total no of animals affected is lesser than the summation of individual infestation because some animals were infected by more than one type of tick.

Table 2: Age related prevalence of ticks in cattle from selected grazing sites in Nsukka urban, Enugu State, Nigeria

			Tick Burden	
Age of animals	Name of Parasite	Number of Cattle Infected (%)	Mean	Odd Ratio
Young (≤2.0 years) n = 90	*R. (B.) microplus*	73 (81.11)	1.76±0.12	Young Vs
	A. variegatum	51 (56.66)	1.23±0.05	Adult 2.83
	R. (B.) annulatus	9 (10)	1.00±0.00	
	A. maculatum	4 (4.44)	0.04±0.00	
	Sub total	87*(96.66)	1.03±0.09	
Adult (≥ 2.0 years) and above n = 49	*R. (B.) microplus*	32 (65.30)	1.53±0.14	
	A. variegatum	27 (55.10)	1.81±0.16	
	R. (B.) annulatus	6 (12.24)	0.66±0.08	
	A. maculatum	1 (2.04)	0.49±0.06	
	Sub total	50*(48.04)	1.50±0.14	
Level of significance P = 0.0029				

n = total animals examined, * = total no of animals affected is lesser than the summation of individual infestation because some animals were infected by more than one type of tick.

prevalence rate of (22.5%), followed by *A. variegatum* (17.7%), *Hyalomma* spp (6.7%) and *Rhipicephalus sanguineus* (3.3%). In contrast, Dipeolu [20] observed *A. variegatum* to be most prevalent in cattle from western Nigeria. Muhammad *et al*. [21] reported *Hyalomma anatolicum* (41%), *R. sanguineus* (25.5%) and dual infestation (33.5%) in cattle in Punjab (Pakistan). Khan *et al.* [22] identified seven species of ticks including *R. sanguineus*, R. (*B.) microplus*, *R.* (*B.) annulatus*, *H. anatolicum*. *H. aegyptium* and *Dermacentor marginatus* from district Faisalabad (Pakistan) and the overall tick burden/infestation was recorded as 28.2%. Iqbal [23] recorded thick infestation as 25% in the same district and identified *H. aegyptium*, *H. anatolicum* and *R.* (*B.) microplus*. Kabir *et al*. [11] reported *R.* (*B.) microphlus* (25%), *R. sanguineus* (13.68%) and *Haemaphysalis bispinosa* (12.63%) from cattle at Upazila in Chittagong district, Bangladesh. Torina *et al*. [24] recorded *R. sanguineus* (19.3%) in cattle from Italy. Yakhchali and Hasanzadehzarza [25] reported (44.5%) tick infestation in cattle in from west Azerbaijan. Mamak *et al*. [26] reported 29.6% tick infestation in cattle from Turkey. Swai *et al*. [27] reported 85.6% tick infestation in cattle from a pastoral in Maasai community, Ngorongoro, Tanzania. The differences in the results of present and earlier studies might be due to variation in the geographical locations, climatic conditions of the experimental areas, region and method of study and sample selection.

Age: Prevalence of ticks was significantly higher in young cattle (96.66%) than in adult (48.04%). Young cattle were 2.83 times more susceptible to tick infestation than adult ones. Prevalence of tick in young cattle (≤2.0 years) were higher in case of *R.* (*B.) microplus* (81.11%) followed by that of *A. variegatum* (4.44%), than in adult cattle (>2.0 years). Prevalence of *R. (B.) microplus* (65.30%) was higher followed by *A. variegatum* (55.10%), *R. (B.) annulatus* (12.24%) and *A. maculatum* (2.04%) (Table 2). The infestation of ticks on the animals was significantly ($p<0.01$) influenced by age, with older animals having fewer tick infestation compared to the younger ones. This indicated that as the animals increase in age, there was a decrease in tick infestation. There are evidences that age, nutrition and hormonal level of the host can influence natural or acquired immunity of cattle to ticks [28-30]. The present findings supports the work of Kabir *et al*. [11] who also found in their study that younger cattle were more susceptible to tick infestation than older cattle in Chittagong district, Bangladesh. The present

Table 3: Sex related prevalence of ticks in cattle from selected grazing sites in Nsukka urban, Enugu State, Nigeria

			Tick Burden	
Sex	Name of Parasite	Number of Cattle Infected (%)	Mean	Odd Ratio
Male n = 116	*R. (B.) microplus*	80 (54.1)	3.63±0.14	Male Vs
	A. variegatum	62 (41.9)	3.58±0.13	Female = 3.04
	R. (B.) annulatus	6 (4.1)	1.83±0.06	
	A. maculatum	0 (0)	0	
	Sub total	85*(73.27)	3.60±0.14	
Female n = 23	*R. (B.) microplus*	26 (47.1)	3.38±0.12	
	A. variegatum	21 (38.2)	3.32±0.10	
	R. (B.) annulatus	3 (5.5)	0.96±0.02	
	A. maculatum	5 (9.1)	1.48±0.08	
	Sub total	38*(26.68)	3.36±0.12	
Level of significance P = 0.003				

n = total animals examined, * = total no of animals affected is lesser than the summation of individual infestation because some animals were infected by more than one type of tick.

study was in contrast with Yakhchali and Hasanzadehzarza [25] who reported higher tick infestation was in adult (60.8%) than in younger cows (20%) in Oshnavich. The susceptibility of young cattles to tick was obvious since ticks are voracious blood suckers and they need blood for survival and reproduction.

Sex: The prevalence of tick was significantly ($p<0.01$) higher in male 116 (76.2%) than in female 23 (21.6%) cattle, males were 3.05 times more susceptible to tick infestation than females. In males, prevalence was higher in case of *R.* (*B.) microplus* (54.1%) followed by *A. variegatum* (41.9%) and *R.* (*B.) annulatus* (4.1%). *A. maculatum* (0%) was absent in the male cattle examined, this may be attributed to their preference for female cattle. In females, prevalence was higher in case of *R.* (*B.) microplus* (47.3%), followed by *A. variegatum* (38.2%), *A. maculatum* (9.1%) and *R.* (*B.) annulatus* (5.5%) (Table 3). Although the exact cause of higher prevalence of tick in males cannot be explained, but it could be attributed to the fact that males were higher in number in the study sites and that male were in better condition during the study period, also absence of pregnancy, lactation (Since only the females do that) make male cattle better choice, since ticks are voracious blood sucker, they would have sucked from cattles in better condition. Norval *et al*. [31] found that tick infestation was relatively more in males than in females cattle in Zimbabwe. Also Scholtz *et al*. [32] reported that tick prefers animals that are in better condition in terms of nutrition, growth and development. Kabir *et al*. [11] reported higher infestation of tick in female 95 (59.37%) cattle than in male 43 (35.83%) cattle at Chittagong District, Bangladesh. The absence of *A. maculatum* in male cattle in this study may be attributed to its preference to female cattle perhaps because of some feminine features; this was in line with the work of Opara *et al*. [33], who did not discover any *A. maculatum* in the male during their survey in Sokoto, Nigeria.

Breed: The present study detected that prevalence of tick was relatively ($p<0.01$) higher in White Fulani cattle 40(38.25%) than the Sokoto Gudali 28(25.19%) cattle. White Fulani cattle were 2.15 times more susceptible to tick infestation than Sokoto Gudali cattle. In White Fulani cattle, prevalence was higher in case of *R.* (*B.) microplus* (30.63%), followed by *A. variegatum* (27.22%), *R.* (*B.) annulatus* (14.44%) and *A. maculatum* (11.16%). In Sokoto Gudali cattle, prevalence was higher in case of *R.* (*B.) microplus* (22.00%), followed by *A. variegatum* (20.45%), *R.* (*B.) annulatus* (10.80%) and *A. maculatum* (8.10%) (Table 4). The present study which observed that the tick burden was more on the White Fulani breed than on Sokoto Gudali, was in line with earlier studies [30, 34]. These authors had established that tick load on animal was affected by breed and nutritional stage, where they reported that the tick load was more on the White Fulani breed. The present finding also agreed with Kabir *et al*. [11] where they observed that tick load was significantly more on local breed (43.82%) than the Cross Breed (24.13%). I In all this findings, *R.* (*B.) microplus* was most prevalent as reported by Tomassone *et al*. [35]. Although the exact cause of higher prevalence of tick infestation in White Fulani cattle was not known, one may assume that infection resistance of Sokoto Gudali may be as a result of antibodies boosted immunity.

Table 4: Breed related prevalence of tick in cattle from selected grazing sites in Nsukka urban, Enugu State, Nigeria

Breed	Name of Parasite	Number of Cattle Infected (%)	Tick Burden	
			Mean	Odd Ratio
White Fulani (Bunaji), n = 85	*R. (B.) microplus*	22 (30.63)	3.86±0.15	White Fulani Vs
	A. variegatum	18 (27.22)	2.72±0.14	Sokoto Gudali =
	R. (B.) annulatus	9 (14.44)	0.94±0.08	2.15
	A. maculatum	6 (11.16)	0.14±0.04	
	Sub total	40*(38.25)	2.12±0.14	
Sokoto Gudali n = 54	*R. (B.) microplus*	18 (22.00)	2.55±0.20	
	A. variegatum	12 (20.45)	2.33±0.19	
	R. (B.) annulatus	5 (10.80)	0.89±0.08	
	A. maculatum	3 (8.10)	0.69±0.05	
	Sub total	28*(25.19)	2.50±0.15	
Level of significance P = 0.005				

n = total animals examined, * = total no of animals affected is lesser than the summation of individual infestation because some animals were infected by more than one type of tick.

Table 5: Seasonal prevalence of ticks in cattle from selected grazing sites in Nsukka urban, Enugu State, Nigeria

Season	Name of Parasite	Number of Cattle Infected (%)	Tick Burden	
			Mean	Odd Ratio
Rainy n = 39	*R. (B.) microplus*	18 (3.88)	2.02±0.28	Dry Vs Rainy
	A. variegatum	10 (2.40)	1.80±0.15	season = 2.56
	R. (B.) annulatus	4 (1.02)	0.78±0.06	
	A. maculatum	2 (0.70)	0.36±0.02	
	Sub total	29*(11.72)	3.06±0.36	
Dry n = 100	*R. (B.) microplus*	58 (30.17)	4.28±0.20	
	A. variegatum	22 (14.54)	2.36±0.16	
	R. (B.) annulatus	7 (2.08)	1.42±0.08	
	A. maculatum	3 (0.33)	0.92±0.02	
	Sub total	62*(32.16)	4.82±0.28	
Level of significance P = 0.0031				

n = total animals examined, * total no of animals is lesser than the summation of individual infestation because some animals was infested by more than one type of tick.

Seasonality: Prevalence of tick was higher in dry season (32.16%) than in rainy season (11.72%). In dry season, prevalence was higher in case of *R.* (*B.) microplus* (30.17%), followed by *A. variegatum* (14.54%), *R.* (*B.) annulatus* (2.08%) and *A. maculatum* (0.33%). In rainy season, prevalence was highest in *R.* (*B.) microplus* (3.88%), followed by *A. variegatum* (2.40%), *R.* (*B.) annulatus* (1.02%) and *A. maculatum* (0.7%). Cattle sampled in dry season were 2.56 times more susceptible to tick infestation than cattles sampled in rainy season (Table 5).

Doube and Wharton [28] had reported that irrespective of breed or nutritional state of the cattle, tick infestation was higher in summer than in winter. O`Kelly and Spiers [36] had demonstrated that animals maintained in the sun carried considerably fewer ticks than animals allowed access to shade. The present finding contrasted the findings of Stuti *et al*. [37] who reported that maximum tick infestation was experienced by cattle during rainy season.

Body Weight: The present study observed that prevalence of tick was higher in younger animals with body weight ≤ 300kg (41.10%) than in older animals with body weight > 300kg (27.15%). Lower body weight cattle were 1.33 times more susceptible to tick infestation than higher body weight animals. Prevalence of tick in lower body weight cattle (≤ 300 body weight) were higher in *R.* (*B.*) *microplus* (29.55%), followed by *A. variegatum* (26.66%), *R.* (*B.*) *annulatus* (9.72%) and *A. maculatum* (8.00%). Also in higher body weight cattle (>300kg body weight), prevalence of *R.* (*B.*) *microplus* (24.00%) was higher, followed by *A. variegatum* (18.27%), *R.* (*B.*) *annulatus* (6.00%) and *A. maculatum* (1.50%) (Table 6). The tick load observed on the cattle were significantly influenced ($p<0.01$) by the weight of the animal. The trend observed in this study was that animals with body weight below ≤ 300 kg have more tick attachment than animals with body weight above 300 kg. Tick burden is highly correlated between age and body weight because the present work showed that ≤ 300kg body weight cattle are younger animals. Ervin *et al*. [38] reported a weight loss

Table 6: Body weight prevalence of ticks in cattle from selected grazing sites in Nsukka urban, Enugu State, Nigeria

			Tick Burden	
Body weight	Name of Parasite	Number of Cattle Infected (%)	Mean	Odd Ratio
100-299 n = 80	*R. (B.) microplus*	40 (29.55)	3.85±0.26	100-399 body weight
	A. variegatum	30 (26.66)	3.23±0.21	Vs 400 and above
	R. (B.) annulatus	11 (9.72)	1.20±0.10	body weight = 1.33
	A. maculatum	10 (8.00)	1.02±0.08	
	Sub total	76*(41.10)	4.15±0.30	
300 and above n = 100	*R. (B.) microplus*	25 (24.00)	2.82±0.18	
	A. variegatum	22 (18.27)	2.38±0.15	
	R. (B.) annulatus	10 (6.00)	1.28±0.10	
	A. maculatum	4 (1.50)	1.00±0.04	
	Sub total	38*(27.15)	3.02±0.20	
Level of significance P = 0.0015				

Table 7: Prevalence of ticks at different body parts of male cattle from selected grazing sites in Nsukka urban, Enugu State, Nigeria

Body Parts of Cattle	Number of Male Cattle Examined	Number of Male Cattle Infected	Prevalence	Tick burden
Armpit	120	28	23.33	1.89 ± 0.15^{b}
Inner thigh	120	32	26.66	2.16 ± 0.21^{a}
Penis	120	17	14.16	1.15 ± 0.09^{b}
Udder & Mammary gland	120	18	15.00	1.21 ± 0.11^{b}
Vulva	120	13	10.80	0.87 ± 0.06^{c}
Scrotum	120	15	12.50	1.01 ± 0.08^{c}

Values in the same column having different superscript are statistically significant ($P < 0.01$), the same no of cattle were examined for the different body parts, i.e (120).

in cattle in pure breed *Bos taurus* and Sokoto Gudali *Bos indicus* because of tick infestation. Also Sutherst *et al*. [39] observed that cattle on the same pasture suffered much greater loss in live weight in all the seasons due to ectoparasite infestation. The present study was in line with reports of weight loss in cattle due to increased tick infestation [40, 41].

Body Parts: Ticks were distributed in different parts of the host body such as base of horn, neck, armpit, inner tigh, penis, udder, mammary gland, scrotum and vulva. The range of tick burden was 1 – 6 per four square inch of heavily infested area in inner tigh (26.66%), followed by armpit (23.33%). The least tick load was observed in vulva (10.80%) (Table 7). This was in line with earlier reported cases of high tick infestation in secluded sites with less hair [42, 43]. Higher tick infestation in certain sites could be ascribed to the fact that ticks prefer warm, moist and hidden sites with good vascular supply and thin skin [43]. In the present study higher tick burden were found in inner tigh (26.66%) and armpit (23.33%). Wanzala *et al*. [44] also reported that feeding site of ticks may have been influenced by attractant odours from the various predilection sites (Armpit and inner tigh).

CONCLUSION

Cattle in Nsukka are infected by four tick species; *Amblyomma maculatum, A. variegatum, Rhipicephalus* (*Boophilus) annulatus* and *R.* (*B.) microplus,* with *R.* (*B.) annulatus* being the most prevalent. Young cattle were more susceptible to tick infestation than older cattle. Males had more ticks than females and prevalence of tick was relatively higher in White Fulani cattle than the Sokoto Gudali cattle. The prevalence of tick was higher in dry season than in rainy season. Lower body weight cattle were 1.33 times more susceptible to tick infestation than higher body weight cattle. The cattle inner tigh was heavily infested by ticks followed by armpit and the least tick load was observed in vulva. Tick infestation may lead to decline in meat, milk fur and skin production. Regular survey of cattle for ticks along with chemotherapy using acaricide is recommended for inclusion into routine management of cattle in the region.

REFERENCES

1. Niyonzema, A. and H.H. Kiltz, 1986. Control of ticks and tick borne diseases in Burundi. ACIAR Proceedings, 17: 16-7.

2. Mehlhorn, H. and P.M. Armstrong, 2010. Encyclopedic reference of parasitology on line. http://parasitology,infromatick. Uni-wuerzburg. Date Accessed March, 11, 2012.
3. Shaw, S.E., 2001. Tick-borne infectious diseases of dogs. Trends in Parasitology, 172: 74-80.
4. Kidd, L. and E.B. Breitschowerdt, 2003. Transmission times and prevention of tick borne diseases in dogs. Compendium, 2510: 742-51.
5. Ghost, S., P. Azhahianambi and M.P. Yadav, 2007. Upcoming and future strategies of tick control: a review. Journal of Vector Borne Disease, 442: 79-89.
6. Rajput, Z.I., S. Hu, W. Chen, A.G. Arijo and C. Xiao, 2006. Review: Importance of ticks and their chemical and immunological control in livestock. Journal of Zhejiang University Science B, 711: 912-21.
7. Bansal, G.C., 2005. Bovine theileriosis in India: an overview. Proceeding of National Academy of Sciences India, 75: 134-43.
8. Perry, B.D., T.F. Randolph, J.J. McDermott, K.R. Sones and P.K. Thornton, 2002. Investigation on Animal Health Research to Alleviate Poverty. International Livestock Research Institute, Nairobi, Kenya, pp:
9. Minjauw, B. and A. McLeod, 2003. Tick borne diseases and poverty. The impact of ticks and tick borne diseases on the livelihoods of small-scale and marginal livestock owners in India and eastern and Southern Africa. Research report, DFID Animal Health Programme, Center for Tropical Veterinary Medicine, University of Edinburgh, UK.
10. Ofomata, F.C., 1976. The Nsukka Environment. Fourth Dimension Publishers, Enugu, Nigeria.
11. Kabir, M.H.B., M.M.H. Mondal, M. Eliyas, M.A. Mamnan, M.A. Hashem, N.C. Delinath, O.F. Miazi, C. Mohiuddin, M.A. Kashem, M.R. Islam and M.F. Elahi, 2011. An epidemiological survey on investigation of tick infestation in cattle at Chittagong District Bangladesh. African Journal of Microbiology Research, 54: 346-52.
12. Soulsby, E.J.I., 1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7th Edition, Bailliere Tidally and Cassel Limited, London.
13. Kaiser, M.N. and H. Hoogstreal, 1964. The Hyalomma ticks of Pakistan, India and Ceylon with key to sub-genera and species. Acarologia, 6: 257-86.
14. McCarthy, V.C., 1967. Ixodoid Ticks, Acarina, Ixodoidae of West Pakistan. PhD. Thesis, Faculty of Graduate School of the University of Maryland, USA.
15. Estrada-Pena, A.A., J. Bouattour, L. Camicas and A.R. Walker, 2004. Ticks of domestic animals in the Mediterranean Region: A Guide to Identification of Species. University of Jaragoza, Pza, ban Francesco s/n, 50001-Zaragoza, Spain.
16. Thrusfield, M., 1995. Veterinary Epidemiology, 2nd edition. Blackwell Science, London.
17. Biu, A.A., J.S. Rabo, J.S. Dawurng and S.I.J. Abubakar, 2012. Survey study on the tick fauna of ruminants. Department of Veterinary, Microbiology and Parasitology, University of Maiduguri, Nigeria. Journal of Veterinary Medicine, 43: 35-6.
18. Olabode, H.O., P.M. Silas and R.I.S. Agbede, 2010. Survey of ectoparasite and their predilection sites on cattle in Bukuru market. Journal of Agricultural and Veterinary Sciences, 2: 70-4.
19. Obadiah, H.I. and A. Shekaro, 2012. Survey of tick infestation of cattle in Zaria Abattoir, Nigeria. Journal of Veterinary Advances, 2(2): 81-7.
20. Dipeolu, O.O., 1975. Survey of tick infestation in cattle, sheep and goats in Nigeria. Bulletin of Animal Health and Production in Africa, 23: 165-72.
21. Muhammad, S.S., Z. Iqbal, N.K. Muhammad and M. Ghulam, 2008. Point prevalence of hard ticks Ixodids infesting domestic ruminants of lower Punjab, Pakistan. International Journal of Agriculture and Biology, 103: 349-51.
22. Khan, M.N., C.S. Hayat, Z. Iqbal, B. Hayat and A. Naseem, 1993. Prevalence of ticks on livestock in Faisalabad, Pakistan. Veterinary Journal, 134: 182-4.
23. Iqbal, M., 1971. Studies on the ectoparasites of livestock with special emphasis on the incidence, economic losses and chemotherapy. M.Sc. Thesis, Faculty of Veterinary Science, University of Agriculture Faisalabad, Pakistan.
24. Torina, A., C. Khoury, S. Caracappa and M. Maroli, 2006. Ticks infesting livestock on farms in Western Sicily, Italy. Experimental and Applied Acarology, 38l: 75-86.
25. Yakhchali, M. and H.S. Hasanzadehzarza, 2004. Study on some ecological aspects and prevalence of different species of hard ticks Acarina: Ixodidae on cattle, buffalo and sheep in Oshnavieh suburb. Pajouhesh-va-Sazandegi, In Animal and Fisheries Sciences, 63: 30-5.
26. Mamak, N., L. GenVer, Y.E. Ozkanlar and S. OzVelik, 2006. Determination of tick species and treatment of cows, sheep and goats in the Sivas-Zara region. Türkiye Parazitoloji Dergisi, 303: 209-12.

27. Swai, E.S., A.N. Mbise, V. Kessy, E. Kaaya, P. Sanka and P.M. Loomu, 2005. Farm constraints, cattle disease perception and tick management practices in pastoral Maasai community-Ngorongoro, Tanzania. Livestock Research and Rural Development, 172: 17-20.
28. Doube, B.M. and R.H. Wharton, 1980. The effect of locality, breed and previous tick experience on seasonal changes in the resistance of cattle to Boophilus microplus Ixodoidea: Ixodoidae. Experientia, 36: 1178-88.
29. Rechav, Y., 1992. Naturally acquired resistance to ticks. A global view. Insect Science and Its Application, 13: 495-510.
30. Bianchi, M.W., N. Barre and S. Messad, 2003. Factors related to cattle infestation level and resistance to acaricides in Boophilus microplus tick populations in New Caledonia. Veterinary Parasitology, 28: 75-89.
31. Norval, R.A.L., B.H. Fivaz, J.A. Lawrence and A.F. Brown, 1984. Epidemiology of tick-borne diseases of cattle in Zimbabwe. Tropical Animal Health and Production, 16: 63-70.
32. Scholtz, M.M., A.M. Spickett, P.E. Lombard and C.B. Enslin, 1991. The effect of tick infestation on the productivity of cows of three breeds of cattle. Ouderstepoort Journal of Veterinary Research, 58: 71-4.
33. Opara, M.N., I. Abdu and I.C. Okoli, 2005. Survey of ticks of veterinary importance and tick-borne protozoa of cattle grazed in very hot months in Sokoto Municipality, Nigeria. International Journal of Agriculture and Rural Development, 6: 168-74.
34. Springell, P.H., 1974. The cattle tick in relation to animal production in Australia. World Animal Review, 10: 19-30.
35. Tomassone, L., J.L. Camicas, P. Pagani, O.T. Diallo, A. Mannelli and D. Meneghi, 2004. Monthly dynamics of ticks Acari: Ixodida infesting N'Dama cattle in the Republic of Guinea. Experimental and Applied Acarology, 323: 209-218.
36. O'Kelly, J.C. and W.G. Spiers, 1983. Observations on body temperature of the host and resistance to the tick Boophilus microplus Acari: Ixodoidae. Journal of Medical Entomology, 20: 498-508.
37. Stuti, V., C.L. Yadav, R.R. Kumar and G. Rajat, 2008. Prevalence of ixodid ticks on bovines in foothills of Uttarkhand state: a preliminary report. Govind Ballabh Pant University of Agriculture and Technology, India. Indian Journal of Animal Science, 78(1): 40-2.
38. Ervin, R.T., F.M. Epplin, R.L. Byford and J.A. Hair, 1987. Estimation and economic implications of lone star tick Acarid: Ixodoidae infestation on weight gain of cattle, Bos taurus and Bos taurus x Bos indicus. Journal of Economic Entomology, 80: 443-55.
39. Sutherst, R.W., G.A. Nortan, N.D. Barlon, G.R. Conway, M. Birley and H.N. Comins, 1979. An analysis of management strategies for cattle tick Boophilus microplus control in Australia. Journal of Applied Ecology, 16: 259-67.
40. Lehmann, T., 1993. Ectoparasites: direct impact on host fitness. Parasitology Today, 9: 8-17.
41. O'Rourke, P.K., 1982. Reliability of tick counts and the relationship between tick count and live weight change in growing Bos indicus x Bos taurus cattle. In animal production in Australia. Proceeding of the Australia Society of Animal Production, 14: 305-15.
42. Spickett, A.M., D. Deklerk, C.B. Erishin and M.M. Scholtz, 1989. Resistance of Nguni, Bonsmara and Hereford cattle to ticks in a bush veldt of South Africa. Ouderstepoort Journal of Veterinary Research, 56: 245-50.
43. Muchenje, V., K. Dzama, M. Chimonyo, J.G. Raats and P.E. Strydom, 2008. Tick susceptibility and its effects on growth performance and carcass chrematistics of Nguni, Bonsmara and Angus steers raised on natural pasture. Animal, 2: 298-304.
44. Wanzala, W., N.F. K. Sika, S. Gule and A. Hassanali, 2004. Attractive and repellent host odours guide ticks to their respective feeding sites. Chemoecology, 14: 229-32.