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Entomology, Ornithology & Herpetology: Current Research

Research Article

Identification of Ixodide Tick Species on Bovine in and Around Mesela (Shanan Dhugo) District, Eastern Ethiopia

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ABSTRACT

The study was conducted on local breed cattle, found in and around Mesela (Shanan Dhugo) district, Western Hararghe from November, 2014 to April, 2015 to identify the major Ixodid ticks species and its prevalence. The sampled animals from peasant associations of Mesela (Shanan Dhugo) district were randomly selected by multistage sampling technique and then examined for tick infestation. Out of the total of 420 cattle examined, 120 (28.57%) were found to be infested by one or more tick species. About 958 adult ticks were collected from the animal body parts and identified to genera and species level. Three tick species of three genera (*Amblyomma*, *Boophilus* and *Rhipicephalus*) were identified. The relative prevalence of each species was *Amblyomma variegatum* (61.18%), *Boophilus decoloratus* (34.59%), and *Rhipicephalus evertsi-evertsi* (4.21%). *Amblyomma variegatum* show higher preference to udder, scrotum and axial; *B. decoloratus* were found prominently on dewlap and neck, and belly and groin; *R. evertsi-evertsi* show higher preference to perianal and vulva, and under tail regions of the body. Among different age and between sex groups of animals examined, infestation was found to be statistically insignificant (P>0.05) whereas, infestation was found statistically significant between body condition score.

Keywords: Cattle; Ixodid ticks; Identification; Local breed

INTRODUCTION

Ticks are the most important ecto-parasites of livestock in tropical and subtropical areas and are responsible for severe economic losses in livestock and are effective disease vectors, second only to mosquitoes in transmitting infectious disease. Ticks belong to the phylum Arthropod, class Arachnid and order Acari. The families of ticks parasitizing livestock are categorized into two, the *Ixodidae* (hard ticks) and *Argasidae* (soft ticks). Though, sharing certain basic properties, they differed in many structures, behavioural, physiological and feeding and reproduction pattern. They are obligate, blood feeding ectoparasites of vertebrates, particularly mammals and birds. It has been estimated that about 80% of the world population of cattle are infested with ticks. The life cycle of ticks (both ixodids and argasids) undergo four stages in their development; eggs, 6-legged larva, 8-legged nymph and adult. According to the number of hosts, Ixodids ticks are classified as one host ticks, two host ticks, three host ticks and Argasids classified as multi host ticks. In one host ticks, all the parasitic stages (larva, nymph and adult) feed on the same hosts; in two host ticks, larva attach to one host, feed and moult to nymphal stage and engorged, after which they detach and moult on the ground to adult; and in three host ticks, the larva, nymph and adult attach to different hosts and all detach from the host after engorging and detaching from the hosts. Ticks are relatively large and long lived, compared to mites, surviving for up to several years. Although, only relatively few of more than 889 species of tick in the world are important to man and his domestic animals, these few species must be controlled if livestock production is to meet world needs for animal protein. Over 79 different species of ticks are found in Eastern Africa and many of these appear to be of little or no economic importance [1]. In Ethiopia, there are 47 species of ticks found on livestock and most of them have importance as vector and disease causing agents and also have damaging effect on skin and hide production. The Genus Amblyomma and Rhipicephalus ticks are predominating in many parts of the country, Boophilus and

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Received: 02-Mar-2022, Manuscript No. EOHCR-21-44456; **Editor assigned:** 08-Mar-2022, PreQC No. EOHCR-21-44456 (PQ); **Reviewed:** 22-Mar-2022, QC No. EOHCR-21-44456; **Revised:** 28-Mar-2022, Manuscript No. EOHCR-21-44456 (R); **Published:** 04-Apr-2022, DOI: 10.35248/2161-0983.22.11.271

Citation: Bekere HY (2022) Identification of Ixodide Tick Species on Bovine in and Around Mesela (Shanan Dhugo) District, Eastern Ethiopia. Entomol Ornithol Herpetol. 11: 271.

Hyalomma ticks also have a significant role. *Amblyomma cohaerence* is prevalent and abundant in western humid highland areas of Ethiopia. *Boophilus decoloratus* and *Rhipicephalus evertsi-evertsi* are widely distributed in most altitudinal ranges [2]. Ticks, besides being important vectors for diseases like theilerosis, anaplasmosis, babesiosis, streptothricosis (Mekonnen) and rickettsiosis (heart water) in domestic animals; they also cause nonspecific symptoms like anaemia, dermatosis, toxicosis and paralysis. Besides to disease transmission ticks inflict a huge economic loss. Production losses due to Ticks and Tick-Borne Diseases (TTBDs) around the globe have been estimated at US$ 13.9 to US$ 18.7 billion annually leaving world's 80% cattle at risk and [3] estimated an annual loss of US$ 500,000 from hide and skin downgrading from ticks, and approximately 65.5% of major defects of hides in Eastern Ethiopia are from ticks. Due to economic and veterinary importance of ticks, their control and the transmission of tick borne diseases remain a challenge for the cattle industry in tropical and subtropical areas of the world and it is a priority for many countries in tropical and subtropical regions. Investigations directed toward determining the magnitude of infestation and the type of species involved will play a magnificent role in designing strategic control toward these parasites. Moreover a species level identification will assist the diagnosis of different tick borne diseases and their respective control programs.

MATERIALS AND METHODS

Study population

The study animal was local breed of cattle from six selected peasant associations of Mesela (Shanan Dhugo) district such as Aba Cabsi, Baha Biftu, Lubu Dhekeb, Meyra Lalisa, Rakobas and Salama. The peasant associations were selected based on their accessibility to transport.

Study design

A cross sectional study was conducted on local breed cattle, found in and around Mesela (Shanan Dhugo) district, from November, 2014 to April, 2015 to identify the major Ixodid ticks, their predilection sites and tick burden in different age groups, body condition score and sex of animals.

Sampling and sample size determination

The sampled animals from six peasant associations in Mesela (Shanan Dhugo) district were selected by multistage sampling techniques. Name of the attendants and their respective animals that were sampled was recorded on prepared format to avoid a risk of repeated sampling (Annex 1). The required sample size for the study was determined by the formula given at 50% expected prevalence, 5% desired precision and 95% confidence interval. Though, the required sample size was computed to be 384, a total of 420 animals were examined to increase the precision of investigation [5].

Tick collection and identification

The entire body surface of the animals was examined thoroughly and adult ticks were collected from one side of the animal body and put into universal bottles containing (10%) formalin. The bottles were labeled according to the predilection sites and sampled animal and then transported to Hirna Regional Veterinary Laboratory. All collected ticks were examined under stereomicroscope and identified to the species level using the taxonomic key described by Kaiser [6]. The count of ticks from half-body zone of each animal was doubled to give the total number of ticks per animal, assuming equal number of infesting ticks on both sides of an animal. Ticks were usually identified by basis capituli, the ornamentation of *scutum*, festoons, Coxae I, length of genothosoma, site preference and location on the host (Annex 3).

Data entry and statistical analysis

The data collected was entered and managed in Microsoft excel and then descriptive statistics was used to analyse the data using Statistical Package for Social Sciences (SPSS) software version 16. The prevalence of tick was determined by dividing the number of positive samples by the total sample size, and expressed as percentage. Descriptive statistics were 5 used to show favourable predilection site of tick species. Chi-square (x^2) test with computed P-value of less than 0.05 was used to determine the statistical significance association of tick infestation rate with sex, age groups as well as body condition score of animals.

RESULTS

Out of the total 420 animals examined, 120 (28.57%) were found to be infested with one or more ticks. Among the peasant association the highest and the lowest prevalence of tick infestation were found 41.42% and 22.85% in Baha Biftu and Aba Cabsi respectively (Table 1).

Peasant association	Examined animals	Infested animals	Prevalence (%)
Aba Cabsi	70	21	30
Baha Biftu	70	29	41.42
Lubu Dhekeb	70	16	22.85
Meyra Lalisa	70	18	25.71
Rakobas	70	17	24.28
Salama	70	19	27.17
Total	420	120	28.57

Table 1 : Prevalence of tick infestation among peasant association.

Out of 420 (206 male and 214 female) cattle examined for the infestation of ticks, 51 (24.75%) male and 69 (32.24%) female

cattle were found to be positive for the presence of ticks on their skin. The highest number of tick infestation (76 out of 120) was found in cattle whose age is greater than 3 years and the lowest (7 out of 120) is seen in calves. Among different age and between sex groups of animals examined, infestation was found to be statistically insignificant (P>0.05) (Table 2).

Parameter	Sex		Age		
	Male	Female	<1 year	1-3 years	>3 years
No of animal examined	206	214	29	141	250
Infested animals	51	69	7	37	76
Prevalence (%)	24.75	32.24	24.13	26.24	30.4

Note: Sex: x^2 =2.882, P-value= 0.09 and age: x^2 =1.064, P-value=0.587

Table 2: Association among tick infestation, sex and age of anim -als by Chi-square.

From total of animal examined, 21 and 399 cattle were having poor and good body condition respectively. Out of 21 poor conditioned animals 13 (61.90%) and out of 399 good conditioned 107 (26.81%) were positive for tick on their skin whereas, infestation was found statistically significant between body condition score in Table 3.

Parameters	Body condition score		
	Poor	Good	Total
No of animal examined	21	399	420
Infested animals	13	107	120
Prevalence (%)	61.9	26.81	28.57

Note: Body condition x^2=12.035, P=0.001

Table 3: Association between tick infestation and body condition of animals by Chi-square.

Ticks were collected from seven body parts namely dewlap and neck, belly and groin, axial, scrotum, vulva and perianal, tail and udder. Different species of ticks found to prefer different predilection sites where *Amblyomma variegatum* found most predominately in the udder, scrotum and axial whereas, *Boophilus decoloratus* found abundantly in the dewlap and neck and belly and groin and *Rhipicephalus evertsi-evertsi* found predominating in perianal and vulva and under tail areas of examined animals (Table 4).

Predilection sites	*A. variegatum*		*B.decoloratus*		*R. evertsi-evertsi*		Total
	No	%	No	%	No	%	%
Dewlap and neck	5	0.86	234	71.34	-	-	25.21
Belly and groin	15	2.58	70	21.34	-	-	8.96
Axial	120	20.68	4	1.21	2	5	13.29
Scrotum	209	36.03	12	3.65	-	-	23.31
Vulva and perianal	-	-	-	-	35	87.5	2.69
Tail	1	0.17	2	0.6	2	5	0.52
Udder	230	39.65	6	1.82	1	2.5	25
Total	580	61.18	328	34.59	40	4.21	-

Table 4: Distribution of ticks in different body parts of animals.

DISCUSSION

The distribution and abundance of the most common tick species infesting cattle in Ethiopia vary greatly from one area to another. In this survey, a total of 948 ticks were collected from a total of 420 local breed animals yielding an overall prevalence of 28.57%. This finding is in agreement with the findings of [7,8]. However, it is different from the findings of [9] who reported an overall prevalence of 89.4% and 81.25% respectively. This difference could be due to the difference in the agro-climatic condition of the study areas. Tick activity was influenced by rainfall, altitude and atmospheric relative humidity. Three genera of hard ticks were identified, namely *Amblyomma*, *Boophilus* and *Rhipicephalus*. *A. variegatum*, *B. decoloratus* and *R. evertsi-evertsi* were the species of ticks identified in the study area. *A. variegatum* (bont tick) was the most abundant of all tick species comprising 61.18% of the collected ticks in the study sites and this result agreed with different reports done by other authors in different parts of Ethiopia such as Naser and Michael in Wolaita zone, Tessema and Gashaw in Assela, Belew and Mekonnen in Holeta, Asrate and Yalew in Haramaya. This could be due to the fact that *A. variegatum* is the most common and widely distributed cattle tick in Ethiopia. It has a great economic importance, because it is an efficient vector of *Cowderia ruminatum* (Eimeria bovis), *Theleria mutan*, *Theleria velifera* ("Benign bovine theileriosis") and viral diseases, Nairobi sheep disease and also aggravates the situation of bovine dermatophilosis (*Dermtophilus congolence*) [10]. Among the tick species *A. variegatum* causes the greatest damage to hides

and skin because of its long mouth part which renders the commodity valueless on world market if the ticks are in high number. *Boophilus decoloratus* (blue tick) was identified as the second tick species in the study sites constituting 34.59% of the total tick collection. This species is reported to be widely distributed in the central Rift valley parts of Ethiopia and this result is agreed with the reports of Haryaya.

B. decolaratus is the commonest and most wide spread tick in Ethiopia, collected in all administrative regions except in the Afar region. This may be due to the geographical location and altitude factors. The one-host ticks of the genus Boophilus that parasitize ruminants represent a hindrance to livestock farming in tropical and sub-tropical countries. They transmit the causative agents of anaplasmosis ("gall sickness") and babesiosis ("red water") in cattle. *Rhipicephalus evertsi-evertsi* (red legged tick) was the third abundant tick species constituting 4.21% of the total adult tick collected which is comparable with the findings of its wide distribution throughout the Ethiopian faunal region. This reported that this species had not showed specific preference for a particular altitude, rainfall zones or seasons; R. evertsi-evertsi has short mouth parts with which to feed on soft area. As a result, it is a possible vector of *Babesia*, *Rickettsia* and *Theleria* and it is also known to convey tick paralysis in Harar, Ethiopia. The proportion of tick infestation was higher in poor body conditioned (61.90%) as compared to good body conditioned animals (26.81%). This was known due to poor body conditioned animals are less resistant to tick infestation and lack enough body potential to build resistance with age advancement. Several authors have reported high infestation of tick results in poor body condition due to consumption of high amount of blood and fluid by those ticks. British cattle breeds having the lowest body condition score under tropical conditions had the highest infestation of ticks. That tick load animal is affected by breed and nutritional stress. Ultimately, this factor affects general body condition, which in turn affects blood composition, respiration rate, appetite and eventually leads to poorer body condition scores. This present study is agreed with previous studies above mentioned.

With regard to predilection site for attachment, different tick species show different site preferences. *A. variegatum* is found in udder, scrotum and axial whereas the *B. decoloratus* species were found on the dewlap and neck and belly and groin. *R. evertsi-evertsi* showed high preference to the perianal and vulva then followed by under tail region. In this study the infestation rate of ticks in the dewlap and neck was 25.21%, udder (25%), scrotum (23.31%), 11 axial (13.29%) and groin and belly (8.96%). Factors such as host density, interaction between tick species, time and season and inaccessibility for grooming determine the attachment site of ticks. The predilection sites found in this study were in line in their study conducted in North Wollo zone and Asella, respectively. Acaricide usage is the main choice of tick control in Mesela (Shanan Dhugo) district. Currently Ivermectin and organophosphate acaricides are most widely used chemicals. Tick control can be also achieved by attacking one or more larval phase along the life cycle chain (Food and Agriculture Organization (FAO), 1984). In addition to acaricide application, appropriate livestock management, zero-grazing, up-grading of tick resistant cattle and implement traditional practices are quite important.

CONCLUSION

The important and abundant tick species investigated in the study area were *A. variegatum*, *B. decoloratus* and *R. evertsi-evertsi*. Acaricide application is the main method of tick control in the district. However, the attention given to controlling the infestation had not been sufficient. Tick should be managed at an economically acceptable level by a combination of techniques and this requires knowledge of the tick species identification, prevalence and an understanding of their epidemiology. This encompasses the selection of tick resistant cattle, acaricide treatment, appropriate livestock management, evaluation and incorporation of traditional practices or remedies that appear to be of value.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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