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

Hassen Yusuf Bekere*

College of Veterinary Medicine, Haramaya University, Haramaya, Ethiopia

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 (P <0.05). It is concluded that the prevalent tick species could also be responsible for transmission of tick borne diseases in addition to their physical damage to the skin. Therefore, further studies should be carried out on tick burden and tick borne diseases thereby mitigating for prevention and control strategies.

Keywords: Cattle; Ixodid ticks; Identification; Mesela district; Western hararghe

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 Urquhart, et al. [1] the life cycle of ticks (both ixodids and argasids) undergo four stages in their development; eggs, 6-legged larva, 8-legged nymph and adult Solomon et al [2] Minjauw and McLeod [3] 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 Taylor, et al. [4] 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. 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 *Hyalomma* ticks also have a significant role Solomon et al [2] *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. Ticks, besides being important vectors for diseases like theilerosis, anaplasmosis, babesiosis Mekonnen, et al [5] streptothricosis and rickettsiosis (heart water) in domestic animals; they also cause nonspecific symptoms like anaemia, dermatosis, toxicosis and paralysis Gebre et al [6] 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 de Castro, 1997, de Wall, 2000, and Ghosh et al [7] Bekele (2002) 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 Lodos et al [8] 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.

***Corresponding author:** Hassen Yusuf Bekere, College of Veterinary Medicine, Haramaya University, Haramaya, Ethiopia, Tel: 2514846574; E-mail: hassenyusuf1@gmail.com

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Moreover a species level identification will assist the diagnosis of different tick borne diseases and their respective control programs. Underlining the facts mentioned above the main objectives of this study were to determine the level of ixodid tick infestation, species involved and preferred predilection sites by the ticks.

Materials and Methods

Study area description

The study was conducted in Mesela (Shanan Dhugo) district. Mesela is located in Western Hararghe zone of Oromia region, Ethiopia. It is situated 395 km East of Finfine and 74 km from Chiro zonal town. The district has daily mean temperature ranging from 14^0C-34^0C and mean annually rain fall ranging from 460mm-930mm. The agro ecological zone of the district highland (baddaa) 20%, mid highland (badda daree) 60% and desert (gammoojjii) 20% and its altitude is between 1200-2700m, and the soil type is silt, sand and clay. The livestock population of the district are 82,137 cattle, 31,507 goats, 15,746 sheeps, 68,683 poultry, 8315 donkeys, and 198 horses and 188 mules. The total area coverage of the district is 65,440.95 hectares, of which 21,584 hectare is cultivated land, 5769.55 hectare is forest land, and 17153.522 hectare is bush land, 11,523.05 hectare is miscellaneous land and others. The district has 25 peasant associations and one town with total human population of 151,698 of which male 76,864 and female 74,834 (ARDO, 2014).

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. The required sample size for the study was determined by the formula given by Thrusfeild (1995) 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.

$n= 1.96^2 P_{exp}(1-P_{exp}) d2$

Where, n = required sample size P_{exp} = expected prevalence

d = desired precision

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 labelled 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 (1987) and Walker et al [9] 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.

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 used to show favourable predilection site of tick species. Chi-square (χ^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 and Discussion

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). From the total of 948 ticks collected, 3 genera and 3 species were identified, of which Amblyomma variegatum accounts 580 (61.18%), Boophilus decoloratus 328 (34.59%) and Rhipicephalus evertsi-evertsi 40 (4.21%). From the total count, A. variegatum was the dominant tick species (61.18%) and R. evertsi-evertsi (4.21%) was the least. The higher proportion of ticks was collected on animals from Baha Biftu (19.62%) while the lower on animals from Aba Cabsi (11.81%) (Table 2). 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 3). 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 (P <0.05) (Table 4). 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-

Table 1: Prevalence of tick infestation among peasant association.

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	27.14
Total	420	120	28.57

Table 2: Distribution of tick species in the peasant associations of Mesela district.

Peasant association	Tick species							
	A. variegatum		B. decoloratus		R. evertsi-evertsi		Total	
	No	%	No	%	No	%	No	%
Aba Cabsi	72	64.58	34	30.35	6	5.35	112	11.81*
Baha Biftu	122	65.59	58	31.18	6	3.22	186	19.62**
Lubu Dhekeb	116	73.41	36	22.78	6	3.79	158	16.66
Meyra Lalisa	98	67.12	48	32.87	0	0	146	15.40
Rakobas	80	49.38	82	50.61	0	0	162	17.08
Salama	92	50	70	38.04	22	11.95	184	19.40
Total	580	61.18**	328	34.59	40	4.21*	948	100.00

** Highest, * slowest prevalence

Table 3: Association among tick infestation, sex and age of animals by Chi-square.

	Sex		Age		
Parameter	**Male**	**Female**	**<1year**	**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

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

Table 4: Association between tick infestation and body condition of animals by Chi- square.

Parameters	Body condition score		
	Poor	Good	Total
No of animal examined	21	399	420
Infested animals	13	107	120
Prevalence (%)	61.90	26.81	28.57

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

Table 5: Distribution of ticks in different body parts of animals.

Predilection sites	Tick species						
	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	0.60	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	

evertsi found predominating in perianal and vulva and under tail areas of examined animals (Table 5). 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 and. However, it is different from the findings of Alemu, et al. [10] 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 Pegram et al [11] 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 and in Wolaita zone, Tessema and in Assela, in Holeta, 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 Theleria mutan, Theleria velifera ("Benign bovine theileriosis") and viral diseases, Nairobi sheep disease and also aggravates the situation of bovine dermatophilosis (*Dermtophilus congolence*) (Sileshi et al [12] 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 Taylor et al [4] *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 Pegram et al [11] Solomon et al [2] and this result is agreed with the reports of in Haramaya. But this finding is disagreed with the reports of in Wolaita zone, in Assela, in Southern Nations, Nationalities, and People's Region**,** who reported highest prevalence in their study area, and who described that 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 (Walker et al [9] *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 described its wide distribution throughout the Ethiopian faunal region. Pegram, et al. [12] 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 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. reported that the British cattle breeds having the lowest body condition score under tropical conditions had the highest infestation of ticks. reported 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%), 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 Solomon and Kassa [2]. The predilection sites found in this study were in line with those reported by 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). In addition to acaricide application, appropriate livestock management, zero-grazing, up-grading of tick resistant cattle and implement traditional practices are quite important.

Conclusion and Recommendations

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. In light of the above conclusion the following recommendations are forwarded: More attention should be given to integrated tick control options through the use of one or more methods like appropriate pasture management in communal grazing area and increase of good nutrition plane to get good performance of productive breeds in the area. Tick control program (application of acaricides) should be planned and applied on regular basis depending on the seasonal variations.

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