International Journal of Advanced Multidisciplinary Research
ISSN: 2393-8870
www.ijarm.com
(A Peer Reviewed, Referred, Indexed and Open Access Journal)
DOI: 10.22192/ijamr Volume 9, Issue 6 -2022

Research Article

DOI: http://dx.doi.org/10.22192/ijamr.2022.09.06.007

Review on identification of ixodidae tick species on bovine in and around Shanan Dhugo district, Eastern Ethiopia

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Keywords

Cattle,
ixodid ticks,
identification,
Shanan
Dhugo district,
Western Hararghe

Abstract

The study was conducted on local breed cattle, found in and around ShananDhugo district, Western Hararghe from April, 2019 to December, 2019 to identify the major Ixodid ticks species and its prevalence. The sampled animals from peasant associations of ShananDhugo 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.

1. 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 (Le Bars, 2009).

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*., 2001, Minjauw and McLeod, 2003).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*., 2007).

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 (Drummond, 2007). Over 79 different species of ticks are found in Eastern Africa and many of these appear to be of little or no economic importance (Cumming, 1999). 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 (Bayu, 2005). 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*., 2001). 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*., 2007). 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 Bekele (2002).

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 (Lodos*et al*., 2000)

Materials and Methods

2.1. Study Area Description

The study was conducted in Shanan Dhugo (Shanan Dhugo) district. Shanan Dhugo 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 (baddadaree) 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, 2019).

2.2 Study Population

The study animal was local breed of cattle from six selected peasant associations of ShananDhugo 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.

2.3 Study Design

A cross sectional study was conducted on local breed cattle, found in and around Shanan Dhugo district, from April, 2019 to December, 2019 to identify the major *Ixodid* ticks, their predilection sites and tick burden in different age groups, body condition score and sex of animals.

2.4 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*. (2003). 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 .

2.5 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

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).

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
LubuDhekeb	70	16	22.85
MeyraLalisa	70	18	25.71
Rakobas	70	17	24.28
Salama	70	19	27.14
Total	420	120	28.57

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 *Rhipicephalusevertsi-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).

Table 2: Distribution of tick species in the peasant associations of Shanan Dhugo 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**
LubuDhekeb	116	73.41	36	22.78	6	3.79	158	16.66
MeyraLalisa	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

Parameter	Sex		Age		
	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

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).

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

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).

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	

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 5).

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 Belew and Mekonnen (2011) and Asrate and Yalew (2012). However, it is different from the findings of Nigatu and Teshome (2012) and Alemu*et al*. (2014) who reported an overall prevalence of 89.4% and 81.25% respectively.

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 .It has a great economic importance, because it is an efficient vector of *Cowderia ruminatum* (*Eimeria bovis*), *Theleriamutan, Theleria velifera* ("Benign bovine *theileriosis*") and viral diseases, Nairobi sheep disease and also aggravates the situation of bovine dermatophilosis *(Dermtophilus congolence*) (Sileshi *et al*., 2007). 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*., 2007).

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*., 2003).

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. (Bianchi *et al.*, 2003) reported that the British cattle breeds having the lowest body condition score under tropical conditions had the highest infestation of ticks. (Kettle, 1995; Bianchi *et al*, 2003; Gazali, 2010) reported that tick load animal is affected by breed and nutritional stress.

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, 2001). The predilection sites found in this study were in line with those reported by Siyoum (2001) and Behailu (2004) in their study conducted in North Wollo zone and Asella, respectively.

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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Quick Response Code	Website: www.ijarm.com Subject: Veterinary Sciences
DOI:10.22192/ijamr.2022.09.06.007	

How to cite this article:
Merga Firdisa Duguma and Mohammedkemal Mustefa Ame. (2022). Review on identification of ixodidae tick species on bovine in and around Shanan Dhugo district, Eastern Ethiopia. Int. J. Adv. Multidiscip. Res. 9(6): 70-77.
DOI: http://dx.doi.org/10.22192/ijamr.2022.09.06.007