



## Study of Hard Ticks Prevalence on Bovine in Sebeta Awas District, Ethiopia

Alemu Tadesse <sup>1</sup>, Abdela Bulbula <sup>2\*</sup>

<sup>1</sup> Haramaya University, College of Agriculture and Veterinary Medicine, Haramaya, Oromia, Ethiopia

<sup>2</sup> Animal Health Institute, Sebeta, Oromia, Ethiopia

\* Corresponding Author: **Abdela Bulbula**

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### Abstract

Ticks are harmful blood sucking external parasites of livestock that are distributed in all agro ecological zones in Ethiopia. Therefore, a cross sectional study was conducted from December 2018 to April 2019 in Sebeta Awas, district, special zone surrounding Finfinne. The aims of the study were to determine the prevalence of tick infestation in relation to some risk factor and to identify different tick species infesting cattle. A total of 514 ticks were collected from different body parts of 384 cattle kept under extensive management system. Out of 384 cattle examined, 87 (22.66%) were found harbor one or more tick species. Three Ixodidae tick genera (*Rhipicephalus/Boophilus*), *Amblyomma* and *Hyalomma*), and six species namely: *R. evertsi evertsi*, *B. decoloratus*, *A. variegatum*, *H. marginatum rufipes*, *A. cohaerens*, and *H. truncatum*, were identified ticks species. *Rhipicephalus evertsi evertsi* was the most abundant tick species (29.2%) followed by *Boophilus decoloratus* (24.5%) and *Amblyomma variegatum* (19.5%). There was no statistically significant difference in prevalence of tick infestation between male and female animals ( $\chi^2=0.0458$ ;  $P=0.83$ ) as well as between the two age groups ( $\chi^2=0.0572$ ;  $P=0.811$ ). Animals with poor body condition score had significantly higher prevalence of tick infestation (43.75%) than medium (28.88%) and good body condition score (9.6%) animals ( $\chi^2=45.644$ ;  $P<0.001$ ) and significance also detected in animals local breed (20.12%) and cross breed (39.22%) ( $\chi^2=9.2031$ ;  $P=0.002$ ). All the tick species had higher number of males than females except *B. decoloratus* which had higher number of females than males. In conclusion, with the occurrence of such degree of tick infestation in the district, the economic importance of tick and tick borne disease in Sebeta Awas, district should be give high priority for sustainable strategies for tick control and prevention methods.

**Keywords:** Bovine, Ixoided tick, Prevalence, Risk factors, Sebeta Awas

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### 1. Introduction

Ethiopia has the largest livestock population in Africa. As stated by (CSA, 2013). The country possess a higher number of Shoats (goat and Sheep), Cattle, Equines, camels and Chickens. Cattle are on the first line by influencing socio-economy by giving milk, meat, hide and skin and agricultural importance's such as fertilizer to enhance productivity for small holdings (Minjauw and Mcleod, 2003) <sup>[27]</sup>.

Parasitic diseases caused by both endo and ecto parasites are become a global problem and considered as a major obstacle in the health and production performance of animals. Out of Ecto- parasites, ticks have significant role by feeding on mammalian blood (Rajput *et al.*, 2006) <sup>[33]</sup>.

Ticks are classified under the phylum of arthropod, class arachnid, and order Acari. The families of ticks parasitizing livestock are categorized in to two, the ixodidae (hard ticks) and Argasidae (soft ticks) through sharing certain basic properties, they differed in many structures, behavioral, physiological, feeding and reproduction pattern (Urquhart *et al.*, 1996) <sup>[48]</sup>. According to the numbers of host, ixodids ticks are classified as one-host ticks, two host ticks, three host ticks and argasid classified as multi-host ticks (Tylore *et al.*, 2007). Among the family ticks, Ixodid are known by its great effect of sucking the blood of cattle, minimize productivity, milk yield and quality of skin and hide and upsurge susceptibility to other disease and are responsible for a wide range of livestock health problems in several countries globally (Tsegaye *et al.*, 2013) <sup>[47]</sup>.

Ticks are important vectors for diseases like babesiosis, anaplasmosis, theileriosis, and cowdriosis (heart water) which are major constraints to the improvement of cattle in the developing world particularly the sub-saharan Africa (Tomassone *et al.*, 2012) [46]. Ticks are common vectors of the economically important animal diseases which includes; theileriosis, anaplasmosis, babesiosis and cowdriosis and causes anemia, dermatitis, toxicosis, and paralysis of infested hosts (Gebre *et al.*, 2007) [14]. Ticks are responsible for severe losses caused either by the effect of blood loss, tick worry, damage to hides and skins and the injection of toxins or through mortality and morbidity caused by the disease transmitted (Morel, 1989) [28].

Over 79 different species are found in eastern Africa but many of these appear to be of little or no economic importance (Cumming, 1999) [11]. Out of 79, 47 species are found (Kassa, 2005) and distributed throughout all agro-ecological areas of Ethiopia (Pegram *et al.*, 1981). Among several tick species widely distributed in Ethiopia, the major tick genera reported are *Amblyomma*, *Rhipicephalus* (*Boophilus*), *Hyalomma* and *Haemophysalis* (Sileshi *et al.*, 2001) comprising several different tick species (De Castro, 1994) [12].

Therefore, relevant data on the prevalence of ticks is essential for the development of effective tick and tick borne disease control strategies. Hence determination of ticks species and its prevalence in field is very critical to prevent and control tick borne disease and it is also important in order to evaluate the impact of tick on animal hide and skin which result in decrement of productivity. Hence, the present study was conducted with general objective of determining the prevalence of hard tick's infestation and to identify the common species of hard tick affecting cattle.

## 2. Materials and Methods

### 2.1. Study Area

The study was carried out from December, 2018 to April, 2019 in Sebeta Awas district. Sebeta is a special district located at south west part of Oromia region, which is 25 km far away from capital city of Addis Ababa. This district has latitude and longitude of 8°54'40"N 38°37'17"S and 8.91111°E 38.62139°W, respectively and an elevation of 2,356 meter above sea level. Animal husbandry in the mixed production system is characterized by a small-holder extensive management system. The registered annual mean rainfall ranges from 860 to 1200 mm and the ambient temperature averages 28°C. In Sebeta Awas district different species of livestock are kept (CSA, 2013). The livestock population of the district area compromised about 94749 cattle, 43224 sheep, 14356 goat, 7049 horse, 23650 donkey, 2957 mule and 84584 poultry (Sebeta Awas Livestock and Fisheries Office report, 2019).

### 2.2. Study Animals

The study populations comprised cattle that are living in Sebeta Awas district and kept under extensive production system with different age, sex, breeds and body conditions score. A total of sample population of 384 heads of cattle were examined out of the source population of 94749 heads of cattle in the district to determine the prevalence hard tick in the area. The age of animals were grouped as young (between 1 and 3 years) and adults (>3 years) (Bitew *et al.*, 2011) [8]. Likewise, the body condition scores (good, medium and poor) were used (Nicholson and Butterworth, 1996).

### 2.3. Study Design

A cross-sectional study was conducted on local and cross breed cattle found in Sebeta Awas district. Data (risk factors) related the animal (breed, sex, age and body condition) were recorded. Animals were sampled by using simple random sampling technique at grazing land, watering point and veterinary clinic found in the district.

### 2.4. Sampling and Sample size

Study units were selected by simple random sampling technique from extensive production system with local and cross breed cattle. The total number of cattle required for the study was calculated based on the formula given by Thrusfield (2018) [44].

$$N = \frac{(1.96)^2 P_{exp}(1 - P_{exp})}{d^2}$$

Where,

N= sample size pexp= Expected prevalence d= Desired level of precision (5%)

Thus, using 50% prevalence with 5% desired level of precision and 95% of confidence interval, the number of animals need in this study was calculated to be 384.

### 2.5. Sample Collection and Laboratory Techniques

The entire body surface of the host was inspected for ticks. After fully restraining of the animal, all visible adult tick species were removed by using forceps and hand holding the basic capitulum so as not to lose the mouthparts of the ticks. Data collection format was used to register the data during tick collection and proper labeling was made on universal bottles with permanent marker. All collected adults ticks were preserved with 70% ethyl alcohol in universal bottles as outlined by Rajput *et al.* (2006) [33] and transported to National Animal Health Diagnostic and Investigation center (NAHDIC). During tick identification in the laboratory the sample was put on petridish and examined under stereomicroscope. In the laboratory techniques for tick examination were as follows: ticks were seen grossly and classified to different genus and species level depending up on their morphology and identification structures they have, such as: presence/absence of festoon, ornamentation of scutum, shape of scutum, basis capituli, genasthosoma, leg color, coxae I and ventral plates according to (Walker *et al.*, 2003).

### 2.6. Data Analysis

The data was entered and managed in MS-Excel spread sheet. The data were analyzed using STATA 14 statistical software. Descriptive statistics was used to describe the prevalence of different ticks infestation. Chi-square ( $\chi^2$ ) test was used to assess if there is a statistically significant association in tick infestation between ages, sex, breeds and body conditions. A statistically significant association between variable was said to exist if the calculated  $p < 0.05$  at confidence level.

## 3. Results

### 3.1. Prevalence and Risk Factors of Tick Infestation

Out of the total 384 examined animals, 87 were positive for one or more ticks species with an overall prevalence of 22.66% each animal harbouring at least a single tick species. The overall prevalence was calculated by dividing the

number of positive sample by total samples size and multiplied by 100. The prevalence of tick infestation among male animals was 23.08% (48/208), while it was 22.16% (39/176) in females with no significant difference ( $\chi^2 = 0.0458$ ;  $p > 0.05$ ). Similarly, there was no significant difference in tick infestation rate between the two age group ( $\chi^2 = 0.0572$ ;  $p > 0.05$ ) (Table 1).

The significance detected in with the two different breed ( $\chi^2 = 9.2032$ ;  $P < 0.05$ ) and cattle with which score different

body condition detected significant prevalence ( $\chi^2 = 44.616$ ;  $p < 0.05$ ) (Table 1). Accordingly, high prevalence was recorded in animals having poor body condition than that of cattle having good and medium body score. So that Considering risk factors and prevalence of hard ticks, body conditions score and breed of cattle has statistically significance ( $P$  value  $< 0.05$ ) being different body condition score and breed affect the prevalence of ticks in the study area.

**Table 1:** Prevalence of hard tick in association of different risk factors

Variable	No. of Examined	No. of Positive	Prevalence (%)	$\chi^2$	P value
Sex					
Male	208	48	23.08	0.0458	0.83
Female	176	39	22.16		
Age					
Young	63	15	23.81	0.0572	0.811
Adult	321	72	22.43		
Breed					
Local	333	67	20.12	9.2031	0.002*
Cross	51	20	39.22		
BCS					
Poor	96	42	43.75	45.644	<0.001*
Moderate	90	26	28.88		
Good	198	19	9.60		

\*Significant

### 3.2. Ticks Identification

A total of 514 ticks were collected, three Ixodidae tick genera (Rhipicephalus/Boophilus), Amblyomma and Hyalomma), and six species namely: *R. eversti eversti*, *B. decoloratus*, *A. variegatum*, *H. marginatum rufipes*, *A. cohaerens*, and *H. truncatum*, were identified in descending order. Accordingly, *R. eversti eversti* was recorded as the most prevalent tick

species and *H. truncatum* was found to be the least prevalent species out of the ticks identified (Table 2).

In this study, male to female sex ratio for tick species indicated higher number of males than females for all species of ticks except *Rhipicephalus (Boophilus) decoloratus* which had (0.13:1) ratio of male to female tick's species (Table 3).

**Table 2:** Summary of Ixodid tick species count in cattle of Sebeta Awas, district Proportion

Tick species	No. tick count	(%)
<i>R. eversti eversti</i>	150	29.2
<i>B. decoloratus</i>	126	24.5
<i>A. variegatum</i>	100	19.5
<i>H. marginatum rufipes</i>	72	14.0
<i>A. cohaerens</i>	44	8.6
<i>H. truncatum</i>	22	4.3
Total	514	100

**Table 3:** Identified ticks species counts and sex ratio

Tick species	Male counts (number)	Female counts (number)	Male to Female ratio
<i>R. eversti eversti</i>	102	48	2.13:1
<i>B. decoloratus</i>	14	112	0.13:1
<i>A. variegatum</i>	68	32	2.13:1
<i>H. marginatum rufipes</i>	42	30	1.4:1
<i>A. cohaerens</i>	34	10	3.4:1
<i>H. truncatum</i>	12	10	1.2:1
Total	272	242	

### 4. Discussion

Different tick species are widely distributed in Ethiopia and a number of researchers reported the distribution and abundance of tick species in different parts of the country (Solomon *et al.*, 2001; Goshu *et al.*, 2007) [37, 16]. The distribution and abundance of the most common tick species infesting cattle in Ethiopia vary greatly from one area to another. In current study, the overall prevalence of tick infestation was found to be 22.66%. This finding is in near

line with Addis (2011) at Holeta, central Ethiopia and that of Haile and Zeryehun (2013) [17] from Bench Maji zone, southwest Ethiopia with overall prevalence of 25.6% and 27.3%, respectively. However, the prevalence of ticks in this study is low, among the reports of (Hussein *et al.*, 2018) [21], (Kebede *et al.*, 2018) [24], Kemal and Abera, (2017) [25], (Tesgera *et al.*, 2016) [42], (Gedilu *et al.*, 2014) [15], and Tadesse and Sultan (2014), who reported an overall prevalence of 61.5, 69.0, 70.2, 60.4, 74.0, and 59.4%

respectively. On the other hand, this current result is high, when I compare to the work of Onu and Shiferaw (2013) <sup>[31]</sup> who indicated tick prevalence 14.5%. This difference could be due to the difference in the agro climatic condition of the study areas, since tick activity was influenced by rainfall altitude and atmospheric relative humidity (Pegramet *et al.*, 1981).

In this study, a higher prevalence was recorded in animals having poor body condition than that of cattle having good body and medium body score. This finding is in line with the work of (Nateneal *et al.*, 2015), Wolde and Mohammed (2014) and (Bilkis *et al.*, 2011) <sup>[6]</sup>. This may be due to the fact that poorly body score animals were least resistant to tick infestation and lack enough body potential to build resistance whereas good body scored animals showed reasonable compact to the infestation according to (Manan *et al.*, 2007) <sup>[26]</sup>. The higher prevalence of ticks observed in crosses than local breed. This study agrees with the findings of Tamiru and Abebaw, (2010) <sup>[39]</sup>. However, this result disagreed with the findings of Kassa and Yalew (2012) <sup>[23]</sup>, who reported a significantly higher prevalence of tick infestation in local breed cattle than the cross breed ones. The significant variation in tick infestation of cattle of between the two breeds in the current study might be low immunity to cross breeds cattle that results from, management system (ability to adapt new environment), lack of enough supplementary feeding and control measures against tick on cross breed cattle. It can also be assumed that it might be due to lack of knowledge of farmers about cross breed cattle as compared to local breed, how to care for cross breed.

Current study revealed that the number of male ticks were higher than the number of females except in *Rhipicephalus* (*Boophilus*) *decoloratus* in which the number of females are higher than males ticks (Table 3). This finding was in agreement with the report of (Kebede *et al.*, 2018) <sup>[24]</sup>, (Nateneal *et al.* 2015), (Bedaso *et al.*, 2014) <sup>[5]</sup> and Abdisa, (2012). This high number of male ticks may be attributed to the fact that fully engorged female tick drops off the host to lay eggs while males tend to remain on the host up to several months to continue feeding and mating with other females on the host before dropping (Solomon *et al.*, 2001) <sup>[37]</sup>. Furthermore, the observed female outnumbering of females ticks in *B. decoloratus* in the current study might be due to the small size of male tick which may not be seen during collection according to (Huruma *et al.*, 2015) who reported the similar result.

In this study *R. evertsi evertsi* were found to be the most abundant tick species in Sebeta Awas district (29.2%). Similar reported was recorded in and around Gonder (36.6%) prevalence by Gashaw (2012) <sup>[13]</sup> in which this tick species was reported the most tick prevalent. Tiki and Addis (2012) <sup>[45]</sup> also reported *R. evertsi evertsi* the second most abundant (29.29%) tick species in and around Holeta. This was due to this tick species shows no apparent preference for particular altitude, rainfall zones or seasons according to (Pegram *et al.* 1981). *B. decoloratus* is one of the most important cattle ticks in Ethiopia for its parasitic effect Morel, (1989) <sup>[28]</sup>. Accordingly *B. decoloratus*, was the second prevalent tick species of cattle in the study area. This agrees with the report of (Hussein *et al.*, 2018) <sup>[21]</sup> in Hetosa District of East Arsi Zone. In the same way, higher prevalence of *B. decoloratus* was reported in and around Asosa, Bossena and Abdu, (2012). *B. decoloratus* is the commonest and most wide spread tick in Ethiopia, collected in all administrative regions

except in the Afar region (Sileshi *et al.*, 2007). *A. variegatum* was the third prevalent tick species of cattle in the study area. However this result was low among the results reported by (Hussein *et al.*, 2018) <sup>[21]</sup>, in Hetosa District of East Arsi Zone, (Tesgera *et al.*, 2016) <sup>[42]</sup>, in Gursum East Hararge, (Awel *et al.* 2017), in Gambela, Birhane (2004) in Awassa and Tesema and Gashaw (2010) <sup>[43]</sup> in Asela in which the *A. variegatum* was the most predominant tick species. *A. variegatum* causes the greatest damage to hides and skin because of its long mouthparts which downgrades the value of these products on world market if infestation is high (Solomon *et al.*, 2001) <sup>[37]</sup>. *H. marginatum rufipes*, was the fourth most predominant in this study, this was near agree with the report of (Awel *et al.*, 2017), in Gambela in which third tick species study in and around Gambela town. This is not near in agreement with different report from different part of the country; *H. marginatum rufipes* was the least abundant tick species in Bako by Hussen (2009), in Assella by Tamru (2008) and in and around Holeta by Tiki and Addis (2011). The low prevalence of this tick species in the study area as stated could be due to the fact that *H. marginatum rufipes* is mostly found in arid parts of tropical Africa by Hoogestral, (1956). *A. cohaerens* was the fifth most tick species abundant in this study area and *H. truncatum* was found to be the least prevalent tick species out of the ticks identified, this result was agree with the result of Regassa (2001), who reported very low of *H. truncatum* in Borena.

## 5. Conclusion and Recommendation

The study on the prevalence of ticks species and its distribution in the area considered as an aid of improving tick control and prevention methods. The major Ticks species investigated in present study area were; *R. evertsi evertsi*. *B. decoloratus*, *A. variegatum*, *H. marginatum rufipes*, *A. cohaerens* and *H. truncatum* in respective of descending order. It was found that animals with poor body condition were more infested by ticks than those in medium and good body condition. Similarly, it was found that cross breed cattle was more infested to ticks than local breeds. The identification of several tick species in this study indicates that the economy importance of ticks and potential existence of tick borne disease in the study area. On the basis of above conclusion, further study on prevalence pattern of tick species, factors responsible for their distribution, and detailed study on the economic losses associated with tick infestation should be necessary for the continuous understanding of the problem and to use improved control strategies.

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