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Prevalence and Species Identification of Ixodidea Tick on Bovine in and Around Bahirda Town West Gojam, North West Ethiopia

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ABSTRACT

A cross- sectional study was conducted in and around Bahir Dar, from November, 2016 to April, 2017 to estimate the prevalence of major ixodidea ticks on bovine and to identify ticks on the species level. Study animals were selected randomly. Out of the total of 384 cattle examined, 157(40.9 %) were found to be infested. About 822 adult ticks were collected both sides of animal body parts, then preserved with 70% alcohol within universal bottle and were identified to species level by using stereo-microscope. From the total ticks collected, four genera and species namely; *Amblyomma varigatum*, *Boophilus decoloratus*, *Rhipicephalus evertsis* and *Hyalomma marginatu* were identified and account for 45.3, 22.9, 15.8 and 17.03%, respectively. From different variables (sex, age, breed and body condition), body condition and predilection sites were statistically significant with tick infestation ($p< 0.05$). The prevalence of tick infestation was found highest in poor body condition animals (16.9%) while in medium and good body condition, it was found (14.58%) and (9.36%), respectively. It has also been evident that the favorable predilection sites of *A.varigatum* ticks were preferred scrotum/udder and pernial region. *B.decoloratus* preferred dewlap, scrotum/udder and *Rh.evertis* had a strong affinity on anus, dewlap and tail tip. *H.marginatum* the perineum region and dewlaps were its hiding sites. From this study we can make a conclusion that the prevalent ticks could also be responsible for transmission of tick borne diseases in addition to their physical damage.

Keywords: Bahir Dar, Infestation, Prevalence, Stereo-microscope, Ticks

Livestock sector has been contributing considerable portion to the economy of Ethiopia and still promising to rally round development of the country (Central Statistical Agency, 2013). The contribution of livestock to the national economy particularly hides (Lorusso *et al.,* 2013) indicated that currently parasitism represents a major obstacle to development and utilization of animal resource.

From health constraints livestock are highly affected by ectoparasites mainly ticks and tick borne disease which has directly affected the socio-economic development of poor farmers (William, 2001). Ticks cause substantial losses in cattle production, in terms of diseases, reduced productivity and fertility and often death and economically the most important ecto-parasites of cattle (Eyo *et al.,* 2014).

Ticks are blood sucking parasite damage hides and skins introduce toxins and predispose cattle to myiasis and dermatophilosis. Moreover, tick reduces body weight gains and milk yield, in addition to creating sites for secondary invasion by pathogenic organisms. Ticks transmit a greater variety of pathogenic micro-organisms than any other arthropod vector groups and are among the most important vectors of diseases affecting animals (Huruma *et al.,* 2015). Ticks which are considered to be most important to health of domestic animal in Africa comprise about seven genera. Among this genera, the main tick genera found in Ethiopia includes *Ambylomma,* sub genus *Rhipicephalus (Boophilus), Haemaphysalis*, *Hyalomma* and *Rhipicephalus.* According to (Gebre *et al.,* 2001) the genus *Ambylomma* and *Rhipicephalus*

are predominating in many parts of country, *Hyalomma* and sub genus *Rhipicephalus* (*Boophilus*) also have significant role. Even though losses due to tick infestation is considerable in Ethiopia, and a number of researchers reported the distribution and abundance of tick species in different parts of the country, there is no work done in estimating the prevalence and distribution of ticks in this area. Therefore, the objective of this study was to determine the prevalence of tick species in cattle in and around Bahir Dar.

MATERIALS AND METHODS

Study area

The study was conducted from November 2016 to April 2017 on bovine in and around Bahir Dar town. Bahir Dar is located at the geographic co-ordinates of 11° 38′ North latitudes and 37° 15′ East longitudes Bahir Dar is located at the distance of 570 km north of Addis Ababa. The altitude of the area ranges from 1500-2300m above sea level. The area receives annual rain fall which has average of 1200-1600mm and the mean annual temperature is 23 ˚C (Bedele Woreda Agricultural Bureau, 2006).

Study population

The study animals were cattle which included all age groups of under extensive management system and included both breeds 318 & 66 local and cross breeds respectively and 203 male and 181 female.

Study design

A cross-sectional study design was conducted to identify the tick species and associated risk factors. Simple random sampling was used to select study animals. The age of animals was grouped as< 1 years, between 1-3 years and >3 years according to the classification method used by Delaunta and Habel (1986). Likewise, the body condition scores (good, medium and poor) were used based on the criteria set by Nicholson and Butterworth (1986).

Sample size determination

The sample size was determined by assuming the expected prevalence of 50% tick infestation. The desired sample for the study was calculated by setting 95% confidence level at 5% absolute precision (Thrusfield, 2007). Therefore, sample size of 384 cattle were examined in the study.

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

Where, n = sample size; p = Expected prevalence; d = Desired level of precision (5%)

Collection of ticks

The whole body surface of the host was inspected for ticks. Ticks were collected from different body sites such as ear, neck, tail, anus, vulva, udder, scrotum and the belly after proper physical restraining of the animals. Adult tick species were removed by hands holding the basic capitulum so as not to lose the mouthparts of the ticks. The collected ticks were placed in to universal bottle containing 70% ethanol for preservation and went to Bahir Dar regional laboratory. Required information like date of collection, age of animal, sex of animal, body condition scores and site of collection were recorded.

Identification of Ticks

The collected ticks were identified using stereomicroscope and classified to different genera levels based on shape of scutum, mouthparts, festoon and ventral plates color of legs, position and presence or absence of posterior groove and marginal spots were considered for species level identification according to Walker *et al.* (2003).

Data analysis

The collected data from field were entered into Microsoft excel spread sheet and analyzed Descriptive statistics, Chi-square test were done at 95% confidence level using Statistical Package for Social Students (SPSS) software version 20.

P-value less than 0.05 at 5% level of significance were considered as statistically significant.

RESULTS AND DISCUSSION

Prevalence and distribution of Ticks: The prevalence of ticks from the total examined cattle was 40.9%. In this study a total of 384 animals were examined randomly. The prevalence between breeds was 133(34.6) local and 24(6.25%) cross were infected and the variation between sex was 81(21.53%) male and 76(19.79%) female animals were infested. Based on age 56(14.58%) 75(19.53%) and 26(6.77%) young, adult and old animals were respectively infested and based on the body condition, 65(16.9%) poor, 56(14.6%) medium and 36(9.36%) good body condition animals were infested. Body condition was statistically significant (P<0.05) and other risk factors (age, sex, and breed) were non- statistically significant (p>0) (Table 2&3).

From 157 positive animals of 822 adult *Ixodidae* ticks were collected. In general, four *Ixodidae* tick species were identified from the study area which were *A.varigatum* 372(45.3%) was the most abundant and widely distributed, *it* followed by *Boophilus decolaratus* 180(21.9%), *Hyaloma marginatum* 140(17.0%) and *Rhipicephallus evrtsi-* 130(15.8%*)* was found to be the least abundant tick species in the study area (Table 1).

Table 1: Proportion of tick species on the examined animals

Species of ticks	No. of animals infested	Proportion of ticks
A.varigatuim	68 (17.7%)	372 (45.3%)
B.decolaratus	36(9.4%)	180 (21.9%)
H.margionatum rufipes	26 (6.7%)	140 (17.0%)
R.evertsi- evertsi	27 (7.1%)	130 (15.8%)
Total	**157 (40.9%)**	**822**

In Ethiopia the distribution of the most tick species vary greatly from one area to other area and a number of researchers reported the distribution (Goshu *et al*., 2007). In the present study, *A.variegatum* (45.3%) was the most abundant tick species in and around bahirdar town. This result was almost the same with reports of (Belew and Mekonnen, 2011) in Holeta district (45.49%), (Tessema and Gashaw, 2010) in Asela town (48.2%) who described *A. varigatum* as the first most abundant tick species in their study areas. Heavy infestation was recorded in Shoa and part of Wollega province. This result opposed with the reports of (Bossena and Abdu, 2012) in and around Assosa town (15%). The difference could be due to the difference in the agro-climatic condition of the study areas, because tick activity is influenced by rainfall, altitude and atmospheric relative humidity according to Pegram *et al.* (1981).

Boophilus decolaratus was found to be the second most

Table 2: Prevalence of tick infestation with relation to age and body condition of studied cattle's.

Tick species	Age of animals	No. Animals examined	No. Animal's positive (%)	Body condition of cattle	No. examined	No. positive (%)
A.varigatum	Young	134	27(7.0%)	Poor	85	28(7.3)
	Adult	185	31(8.1%)	Medium	174	26(6.8)
	Old	65	10(2.6%)	Good	125	14(3.6)
B.decolaratus	Young	134	13(3.4%)	Poor	85	16(4.2)
	Adult	185	17(4.4%)	Medium	174	9(2.3)
	Old	65	6(1.6%)	Good	125	11(2.9)
Rh.evrtsis	Young	134	10(2.6%)	Poor	85	10(2.6)
	Adult	185	14(3.6%)	Medium	174	9(2.3)
	Old	65	2(0.5%)	Good	125	7(1.8)
H.marginatm	Young	134	6(1.6%)	Poor	85	10(2.9)
	Adult	185	13(3.4%)	Medium	174	9(3.1)
	Old	65	8(2.1%)	Good	125	4(1.08)
X^2 = 6.193		**p = (0.626)**			**X^2 = 60.698**	**P = (0.00)**

Table 3: Prevalence of tick infestation in association with sex and breed of cattle

Spp. of ticks	Sex of cattle	No. of examined animals	No. of Infested animal (%)	Breed of cattle	No. of examined animals	No. of Infested animal (%)
A. varigatum	Male	203	36(9.4)	Local	318	57(14.84)
	Female	181	32(8.3)	Cross	66	11(2.86)
B. decoloratus	Male	203	21(5.5)	Local	318	30(7.81)
	Female	181	15(3.9)	Cross	66	6(1.56)
R. evertis	Male	203	10(2.6)	Local	318	22(5.73)
	Female	181	16(4.2)	Cross	66	4(1.04)
H. marginatum	Male	203	14(3.6)	Local	318	24(6.25)
	Female	181	13(3.4)	Cross	66	3(0.78)
	Total		**157(40.9)**		**384**	**157(40.9)**
	$X^2 = 2.68$ p = (0.613)			$X^2 = 1.09$ p= (0.613)		

Table 4: Prevalence of ticks in association with attachment site of the cattle

	Prevalence of tick Species (%)					
Predilection site	***A.varigatm***	***B.decolarats***	***H.marginatm***	***Rh.eevertsis***	**Total**	**X^2, (P-value)**
Udder	30(7.81)	5(1.3)	1(0.26)	2(0.52)	38(9.89)	
Scrotum	24(6.25)	4(1.04)	0(0.00)	0(0.00)	28(7.29)	
Dewlap	10(2.6)	18(4.69)	4(1.04)	3(0.78)	35(9.11)	
Anus	0(0.00)	5(1.3)	3(0.78)	4(1.56)	12(3.67)	749.02 (0.00)
Tail	0(0.00)	2(0.52)	1(0.26)	11(2.86)	15(3.64)	
Pernial region	2(0.52)	2(0.52)	18(4.69)	6(1.56)	29(7.29)	
Total	**66(17.18)**	**36(9.37)**	**27(7.55)**	**26(7.28)**	**157(40.89)**	

abundant tick species in this study (21.9%). Similar to our study, Bossena and Abdu (2012) in and around Assosa town reported as a prevalence of (15.6%), Nibret *et al.* (2012) in Chilga District (18.22%) and Tessema and Gashaw (2010) in Asella (22%) of *Boophilus decolaratus*. This tick species shows no apparent preference for particular altitude, rainfall zones or seasons and native distribution Pegram *et al*. (1981). On the other findings *Boophilus decoloratus* as the most abundant tick of cattle Alemu *et al*. (2014) and Gedilu *et al.* (2014) and Bedaso *et al*. (2014) who reported with prevalence of 40.86, 47.93 and 26.3%, respectively. This might be due to *B. decoloratus* been abundant in wetter highlands and sub-highlands receiving more than 800 mm rainfall annually according to the finding of Pegram *et al*. (1981).

Hayalomma marginatum was confirmed to be the third abundant tick species (17.03%) in this study. The result of the present study was in line with research works of Tessema and Gashaw, (2010) in Asela (15.4%), Belew and Mekonnen (2011) (18.0%) in Holeta indicated the prevalence of *Hayalomma marginatum* in the respective study area. But the result of this study disagrees with the report of Meaza *et al*. (2013) who reported 33.13% prevalence which was much higher than current result. On the other hand, the result of this study was higher than the research of Shiferaw and Onu, (2013) in west Ethiopia, reports of Hussen (2009) in Bako, (Tamiru and Abebaw, 2010) in Assela and (Tiki and Addis, 2011) in and around Holeta who reported 8.0 1.2, 2.5 and 1.86%, respectively. The low prevalence of this tick species could be due to altitude difference between study areas as stated by (Pegram *et al*., 1981).

Rhipicephalus evertsi-evertsi was the least abundant tick collected with (15. 8%) of the total counts on this

study. This result was agreement with the previous work reported by Tamerat *et al.* (2015) and Alemu *et al.* (2014) in eastern Hararghe zone with prevalence of 13.5 and 11.5% respectively. The finding was opposed with the reported of Abdisa, 2012 and Huruma *et al.* (2015) who reported 50.9 and 53.4%, respectively. It was the most abundant tick species with prevalence of 53.4% according to Huruma *et al.* 92015) finding. The findings of Sultan and Tadesse (2014) and Bedaso *et al*. (2014) were also greater than the current finding with prevalence of 32.2%, 41% and 45.49%, respectively. Warm moderately dry lowlands receiving minimum annual rainfall is prefer habitat (Feseha, 1997).

The proportion of tick infestation on the age group was higher on adult (19.53%) cattle as compared to young cattle (14.58%) and old cattle's (6.77%). This finding was in line with the finding of Yakhchali and Hasanzadehzarza (2004), who reported tick infestation was higher in adults (60.8%) than in the youngest. Meaza *et al*. (2013 and Tessema and Gashaw (2010) also stated that a higher proportion in adults cattle than youngest. In other reporters association with age groups of animals, there was no difference in infestation level among age groups according to the reports of (Tamiru and Abebaw, 2010) and the reports of (Kalil, 2010), in this study the variation was higher on adult age groups, adult animals were more infested than young and old animals due to the animals in this age group were traveling along distance for searching feed and water within this situation these age groups were more exposure.

There was statistically non-significant association (P >0.05) in the infestation rate between sex groups, there was some higher variation was recorded in males (21.09%) compared to females (19.79%). Even if the variation was that much has great difference, it may be associated with female animals were provided good management system than male animals due to dairy purpose where as males were kept on the free grazing lands and might not provided good management system when compared to female animals.

Body condition of animals was statistically significantly (P < 0.05) the prevalence of poor, medium and good body condition animals were 16.9%, 14.58% and 9.36% respectively. This may be due to the fact that poor conditioned animals were least resistant to tick infestation and lack enough body potential to build resistance whereas over-conditioned animals showed reasonable combat to the infestation according to Manan *et al*. (2007). This study also in line with the work of Bilkis *et al.* (2011) and Wolde and Mohame (2014) who reported cattle with poor body condition were significantly infested more than that of cattle with normal body condition.

Study revealed that the presence of tick infestation in local breed was high with a prevalence of 34.6% while in Cross breeds 6.25%, it was statistically non- significant variation (P>0.05) in tick infestation in different cattle breeds might be attributed to differences in management systems and lack of emphasis to control ticks infestation on local breeds. The current finding was in line with the reports by Meaza *et al.* (2013) in Bahir Dar Kassa and Yalew (2012) in Haramaya district of east Ethiopia, Tessema and Gashaw (2010) in Asela stated as the prevalence infestation was found higher in local breed cattle than of tick cross breed ones.

Regarding the attachment site of the ticks, it was statistically significant (p < 0.05) on difference attachment site on cattle. The predilection sites of hard ticks in this study mostly were udder/scrotum, dewlap, anus and other parts, and corroborate with those reported by Wolde and Mohamed (2014) at southern part of Ethiopia. In fact states that short *hypostome* ticks like *Ripicephalus* usually prefer upper body parts including nape of neck and margin of anus and under tail while long *hypostome* ticks like *Ambloyomma* attaches to lower parts of the animal body, which was also the case in the present study (Stachurski, 2000).

CONCLUSION

The important and abundant tick species investigated in the study area were *Amblyomma varigatum*, *Boophilus decoloratus*, *Rhipicephalus evertsis* and *Hyalomma marginatu*. The prevalence of tick infestation was found highest in poor body condition animals than medium and good body condition. It

has also been evident that the favorable predilection sites of *A.varigatum* ticks were preferred scrotum/ udder and pernial region. *B.decoloratus* preferred dewlap, scrotum/udder and *Rh.evertis* had a strong affinity on anus, dewlap and tail tip. *H.marginatum* the perineum region and dewlaps were its hiding sites.

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