Journal of Veterinary Medicine and Animal Health Vol. 4(6), pp. 84-88, September 2012
Available online at http://www.academicjournals.org/JVMAH
DOI: 10.5897/JVMAH12.035

Full Length Research Paper

Prevalence of cattle tick infestation in and around Haramaya district, Eastern Ethiopia

Surafel Asrate[1]* and Amsalu Yalew[2]

College of Veterinary Medicine, Haramaya University, Dire Dawa, Ethiopia.

Accepted 6 August, 2012

We conducted a survey to determine the prevalence of hard ticks, their predilection sites and relation to breed, sex, and age group of animals. Cattle coming to clinic from different localities found in Haramaya district were selected by systematic random sampling technique and then examined for tick infestation. A total of 560 animals were examined of which 186 (33.21%) were found infested with one or more ticks. Among the total, 1446 ticks collected three genera; *Amblyomma*, *Boophilus*, and *Rhipicephalus,* and five species identified. The relative prevalence of each species was *Amblyomma variegatum* (38.87%), *Amblyomma coherence* (8.30%), *Boophilus decoloratus* (31.54%), *Rhipicephalus pulchellus* (6.64%) and *Rhipicephalus evertsi evertsi* (14.66%). *A. variegatum* and *A. coherence* show higher preference to axial, scrotum/udder, groin and belly. *B. decoloratus* species were found prominently on the back and neck. *R. evertsi evertsi* and *R. pulchelus* showed high preference to the under tail and perianal and vulva regions of the body. The male to female sex ration of the collected ticks was found 1.96:1, showing higher proportion of male than their counterparts. The prevalence of tick infestation was found significantly higher (P < 0.05) in local breed cattle (58.18%) than cross breed ones (10.55%), whereas no statistically significant association was observed among age groups, between sex groups and different localities (P > 0.05).

Key words: Haramaya, cattle, infestation, *Ixodide* ticks.

INTRODUCTION

Ticks are effective disease vectors, second only to mosquitoes in transmitting infectious disease (Le Bars, 2009). Major cattle tick-borne diseases in Ethiopia are anaplasmosis, babesiosis, theileriosis (Mekonnen et al., 1992) and streptothricosis (Mekonnen, 1996). 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; Ghosh et al., 2007). Bekele (2002) estimated an annual loss of US$500000 from hide and skin downgrading from ticks, and approximately 65.5% of major defects of hides in Eastern Ethiopia are from ticks.

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, ticks are common in all agro ecological zones (Pegram et al., 1981). According to Bayu (2005), 47 species of ticks are found on livestock in the country. 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). *Amblyomma cohaerence* is prevalent and abundant in western humid highland areas of Ethiopia. *Boophilus decolaratus* and *Rhipicephalus evertsi evertsi* are widely distributed in most altitudinal ranges (Bekele, 1987).

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., 2000). Investigations directed toward determining the magnitude of infestation and the type of species involved will play a magnificent role in designing strategic control towards these parasites. Moreover, a species level

*Corresponding author. E-mail: picolo.sur@gmail.com.

Table 1. Distribution of tick species.

Tick species	Total count (%)
A. variegatum	562 (38.87)
A. coharence	120 (8.30)
B. decoloratus	456 (31.54)
R. pulchellus	96 (6.64)
R. evertsi evertsi	212 (14.66)

identification will assist the diagnosis of different tick borne diseases and their respective control programs. Underlining the facts earlier mentioned, we initiated to determine the level of tick infestation, genus and species involved, preferred predilection sites by the ticks and to assess the tick burden between breed groups, sex groups and among age groups.

MATERIALS AND METHODS

Study area

Haramaya district is located in the Eastern Hararghe zone of Oromiya region, Ethiopia. It is situated 508 km east of Addis Ababa. The district has about 63,723 cattle, 13,612 sheep, and 20,350 goats, 15,978 donkeys, 530 camels and 42,035 chickens. Topographically, it is situated at altitude of 1600 to 2100 m above sea level at 9°26N latitude and 42°3E longitudes with the mea n annual temperature and relative humidity of 18°C and 68%, r espectively. The area receives an average annual rain fall of approximately 900 mm, with a bimodal distribution pattern, picking in mid April and mid August.

Study design and study population

A cross-sectional study was conducted on local and cross breed cattle, found in and around Haramaya district, from November, 2010 to June, 2011 to identify the major *Ixodide* ticks, their predilection sites and tick burden in different age groups, breeds and sex of animals.

The sample animals were selected by systematic random sampling techniques, at predefined intervals from animals coming to Haramaya veterinary clinic. Animals came from different localities to this clinic, mainly from Ifa-Oromia, Adele, Tujgab-isa and Haramaya town. Name of the attendants and their respective animals that are sampled were recorded to avoid a risk of repeated sampling. The required sample size for the study was determined by the formula given by Thrusfield (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 560 animals were examined to increase the precision of our investigation.

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. 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. Name, age, breed and sex of the animals along with date of collection and attendants name were recorded at the time of collection.

Data entry and statistical analysis

The data collected were entered and managed in Microsoft excel. An intercooled Stata 7 software (Stata Corporation, 2001) statistical program was employed for the data analysis. The prevalence of tick was determined by dividing the number of positive samples by the total sample size, and was expressed as percentage. Chi-square (χ^2) test was used to assess if there was a statistically significant difference in tick infestation within different groups. For this analysis, P-value less than 0.05 was considered significant.

RESULTS

Out of the total 560 animals examined, 186 (33.21%) were found infested with one or more ticks. From the total of 1446 ticks collected, 3 genera and 5 species were identified, of which *Amblyomma* accounts 682 (47.16%), *Boophilus* 456 (31.4%) and *Rhipicephalus* 308 (21.30%). From the total count, *A. variegatum* was the dominant tick species (38.87%) and *Rhipicephalus pulchellus* (6.64%) was the least (Table 1). The higher proportion of ticks was collected on animals coming from Ifa-oromia (37.97%) while the lower on animals from Haramaya (11.96%) (Table 2).

Ticks were collected from 8 body parts namely axial, perianal and vulva, back and neck, dewlap and head, groin and belly, under tail, ear, and udder/scrotum. Different species of ticks found to prefer different predilection sites where *Amblyomma variegatum* and *A. cohaerens* found most predominately in the axial, groin and belly, and udder/scrotum whereas, *R. evertsi evertsi* and *R. pulchellus* found predominating in the under tail and perianal and vulva and *B. decoloratus* found abundantly in the back and neck areas of examined animals (Table 3). During the study, the collected ticks were identified as male and female; the proportion of male ticks was found higher than its counterpart (Table 4).

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 breed groups ($P < 0.05$). Infestation shows no statistical significant association among different localities found in Haramaya district ($P > 0.05\%$) (Table 5).

DISCUSSION

In this survey, a total 1,446 ticks were collected from a total of 560 local and cross breed animals yielding an

Table 2. Major tick species and its distribution in the different localities of the study area.

Site	Tick species										Total	
	A. variegatum		*A. cohaerens*		*R. evertsi evertsi*		*R. pulchellus*		*B. decoloratus*			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ifa- oromia	215	39.16	41	34.17	75	35.38	22	22.92	196	42.98	549	37.97
Tujgab-isa	183	37.97	33	6.85	84	17.43	44	17.43	138	28.63	482	33.33
Adele	88	36.63	24	9.92	35	14.46	16	6.61	79	32.6	242	16.74
Haram-aya	76	43.93	22	12.72	18	10.40	14	8.09	43	24.85	173	11.96
Total	562	38.87	120	8.30	212	14.66	96	6.64	456	31.54	1446	100

Table 3. Distribution of ticks in different body parts of animals.

Attachment site	Tick species collected {No. (%)}				
	A. variegatum	*A. cohaerens*	*R. evertsi evertsi*	*R. pulchellus*	*B. decoloratus*
Axial	195 (34.69)	56 (46.66)	5 (2.35)	-	5 (1)
Perianal and vulva	-	-	43 (20.28)	35 (16.50)	4 (0.87)
Udder/scrotum	189 (33.62)	33 (27.5)	6 (2.83)	-	17 (3.72)
Dewlap and head	-	-	4 (1.88)	-	30 (6.57)
Groin and belly	173 (30.78)	27 (22.5)	3 (1.41)	-	18 (3.94)
Under tail	5 (0.008)	4 (3.33)	151(71.22)	61(28.77)	6 (1.31)
Ear	-	-	-	-	8 (1.75)
Back and neck	-	-	-	-	368 (80.70)

Table 4. Sex ratio of major tick species in the study area.

Tick species	Male	Female	Sex ratio	Total
A. varigatum	324	238	1.36:1	562
B. decoloratus	358	98	3.65:1	456
R. evertsi evertsi	142	74	1.9:1	216
A. cohaerence	78	42	1.86:1	120
R. pulchelus	56	36	1.55:1	92
Total	958	488	1.96:1	1446

overall prevalence of 33.21%. And this finding is in agreement with the findings of Belew and Mekonnen (2011). However, it is different from the findings of Nigatu and Teshome (2012) who reported an overall prevalence of 89.4%. 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., 1981).

Three genera of hard ticks were identified, namely *Amblyoma*, *Boophilus* and *Rhipicephalus*. *A. variegatum, A. cohaerens, R. evertsi evertsi*, *R. pulchellus* and *B. decoloratus* were the species of ticks identified in the study area.

A. variegatum was the most abundant of all tick species comprising 38.87% of the collected ticks in the study sites. And this could be due to the fact that *A. variegatum* is the most common and widely distributed cattle tick in Ethiopia (Morel, 1980; Pegram et al., 1981; Assefa, 2004). It has a great economic importance, because it is an efficient vector of *Cowderia ruminatum* (*Eimeria bovis*) and greatest damage to hide, due to its long mouth parts, so it will reduce the value on world market (Solomon et al., 2001).

B. decoloratus was identified as the second tick species in the study sites constituting 31.54% of the total tick collection. This species is reported to be widely distributed in the central Rift valley parts of Ethiopia (Pegram et al., 1981; Solomon et al., 2001).

R. evertisi evertsi was the third abundant tick species constituting 14.66% of the total adult tick collected which is comparable with the findings of Solomon et al. (2007). Hoogstral (1956) described its wide distribution through-

Table 5. Tick burden within group of sex, breed, age and localities.

Category	Total No. of animals examined	Total No. of animals infested {No. (%)}	Total No. of tick collected	P-value
Sex				
Male	273	85 (31.11)	695	0.308
Female	287	101(35.19)	751	
Breed				
Local	380	167(58.18)	1231	0.0001
Cross	180	19 (10.55)	215	
Localities				
Ifa-oromia	115	38 (33.04)	549	
Tujgabisa	122	48 (39.34)	482	0.331
Adele	130	37 (28.46)	242	
Haramaya	193	63 (32.64)	173	
Age groups				
<1 year	98	32 (32.65)	378	
1-3 year	188	57 (30.31)	415	0.51
>3 year	274	97 (35.40)	653	

out the Ethiopian faunal region. Pegram et al. (1981) reported that this species had not showed specific preference for a particular altitude, rainfall zones or seasons; and it is also known to convey tick paralysis in Harar Ethiopia (Morel, 1980).

A. cohaerens was the fourth abundant tick spices constituting 8.30% of the total tick collection. This study indicates that *A. cohaerens* is not common in the study area where there is shortage of rain fall. This result has agreement with the report stated by Feseha (1983) as *A. cohaerens* is abundant in areas where climate is humid most of the year. De Castro (1994) also reported that this tick species is most common in Western Ethiopia. Regardless of its prevalence and place of collection, the presence of *A. cohaerens* in different parts of Ethiopia has been reported by various researchers (Kaiser, 1987) in Western Ethiopia, Surafel (1996) in Tigray and Mekonnen et al. (2001) in central Ethiopia. It has also been reported as prevalent in many other parts of the country such as Rift valley (Solomon and Kasaa, 1996; Pegram et al., 1981) and in high land areas of Harar and Diredawa district (Manuri and Tilahun, 1991).

R. pulchellus was the least abundant tick species in the study area constituting 6.64% of the total tick collection. Feseha (1983) reported that it is highly distributed in the arid regions, chiefly in the Rift valley and east. Dejenu (1988) affirmed the abundant of this tick species in Southern range land of Ethiopia. *R. pulchellus* has been implicated as a probable vector of Nairobi sheep disease that exist in north of Somali and clinical case have been reported in Jijiga (Southeast Ethiopia). The distribution of the *R. pulchellus* coincides with that of the disease it transmits (Morel, 1980).

The male to female sex ratios recorded in the present study for *A. varigatum*, *A. cohearens*, *B. decoloratus*, *R. evertsi evertsi* and *R. puluchulus* are in agreement to the earlier works of Kaiser (1987) and Solomon et al. (2007) in more number of males. This is most probably attributed to the fact that fully engorged female ticks' drop-off to the ground to lay eggs while males tend to remain on the host up to several months later to continue feeding and mating with other females as has been observed by Solomon et al. (2001) and Tamiru et al. (2010).

With regard to predilection site for attachment, different tick species show different site preferences. *A. varirgatum* and *A. cohearens* are found in scrotum, udder dewlap and vulva whereas the *B. decoloratus* species were found on the dewlap, udder, belly and scrotum. *R. evertsi evertsi* and *R. pulchelus* showed high preference to the anogenital region of the body and then followed by the inside of the ear.

Tick infestation was significantly higher in local breed cattle as compared with cross cattle, where $P < 0.05$ ($P = 0.000$), and this finding is in agreement with the findings of Kasier et al. (1987). And the higher prevalence of tick infestation in local breed animals may be attributed to the currently existing modified animal husbandry practice where cross breed/high yielding animals are kept most of the time indoor with semi-intensive care, whereas local breed cattle are kept under extensive farming system.

Therefore, the chance of occurrence in local breed cattle is greater than cross breeds.

The proportion of tick infestation was higher in animals with age >3 years as compared to animals <3 years of age. However, there was no statically significant difference (P > 0.05) and the higher proportion may be due to outdoor management and of long distant movement of adult animals to search feed and water as compared to younger animals, so the chance of exposure is higher. This finding is also in agreement with the findings of Feseha (1997), the higher proportion in adult cattle. Male and female animals are found to be with equal chance of infestation where P > 0.005. Ticks will cause anemia and they may interfere with feeding leading to loss of production and weight gain; they may cause economic loss due to hide and skin rejection and most importantly they may serve as a vectors for a variety of diseases.

ACKNOWLEDGEMENTS

We would like to extend our appreciations to Haramaya Veterinary Clinic and Haramaya University College of Veterinary Medicine Management Board for all the supports we received during the study.

REFERENCES

Assefa B (2004). A survey of ticks and tick-borne blood protozoa in cattle at Assela, Arsi Zone. DVM thesis, FVM, AAU, Debrezeit, Ethiopia.

Bayu K (2005). Standard veterinary laboratory diagnostic manual. Vol. III. MOA Addis Ababa.

Bekele T (2002). Studies on seasonal dynamics of ticks of Ogaden cattle and individual variation in resistance to ticks in Eastern Ethiopia. J. Vet. Med. 49: 285–288.

Belete M (1987). A preliminary survey of ticks onfour domestic animals in Nekemte Awraja. DVM Thesis, AAU, FVM, Debre Zeit, Ethiopia.

Belew T, Mekonnen A (2011). Distribution of Ixodid Ticks on Cattle in and Around Holeta Town, Ethiopia. Glob. Vet. 7(6):527-531.

Cumming GS (1999). Host distributions do not limit the species ranges of most African ticks. Acari: Ixodida Bull. Entomol. Res. 89:303-327.

De Castor JJ (1994). A survey of tick species in western Ethiopia including the previous findings and recommendation, for further tick survey in Ethiopia. Technical report AG DP/ETH/83/023.FAO, Rome, pp. 1-83.

De Castro JJ (1997). Sustainable tick and tick borne disease control in livestock improvement in developing countries. Vet. Parasitol. 71:77-97.

de Wall DT (2000). Anaplasmosis control and diagnosis in South Africa. Ann. N. Y. Acad. Sci. 916:474-483.

Dejenu GA (1988). Preliminary survey of tick on domestic animals in Bale administrative Region. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debre zeit, Ethiopia.

Feseha G (1983). Notes on tick species and tick born disease of domestic animals in Ethiopia. FVM, AAU, Debre Zeit, Ethiopia. pp. 21-23.

Feseha, B (1997). species composition and distribution of Ixodid tick in Eastern Harerghe, Ethiopia. Agric. Sci. 16: 37-51.

Ghosh SP (2007). Azhahianambia and M. P. Yadav, Upcoming and future strategies of tick control: a review. J. Vector Borne Dis. 44:79-89.

Bekele H (1987). Study of the topographical distribution of tick on economically important domestic animals in Illubabor. DVM thesis, FVM, AAU, Debrezeit, Ethiopia.

Hoogstral H (1956). African Ixodidae I. Ticks of the Sudan (with Special Reference to Equatorial Province and with Preliminary Reviews of the Genera *Boophilus*, *Margaroups* and *Hyalomma*). US Government Department of Navy, Bureau of Medicine and Surgery, Washington, DC.

Kaiser MN (1987). Ethiopia, Report on tick taxonomy and biology, AG:DP /ETH/83/023 Consultant report .Food and Agricultural Organization of the united Nations. pp. 92.

Le Bars C (2009). Tick-borne disease management. Veterinary Times, 18th May.

Lodos JO (2000). Boue and J. Fuente. Model to simulate the effect of vaccination against *Boophilus* ticks on cattle. Vet. Parasitol. 87(4):315-326.

Manuri K, Tilahun J (1991). A survey of Ectoparasites of cattle in Harer and Dire Dawa districts, Harangue Administrative Region of Ethiopia. Bull. Anim. Health Prod. 30:45-53.

Mekonnen S (1996). Epidemiology of ticks and tick-borne diseases in Ethiopia: Future research needs and priorities. In: Irvin A.D., McDermott J.J. and Perry B.D. (eds), Epidemiology of Ticks and Tick-borne Diseases in Eastern, Central and Southern Africa. Proceedings of a Workshop Held in Harare, 12–13 March 1996. ILRI (International Livestock Research Institute), Nairobi, Kenya. 174 pp.

Mekonnen S, de Castro J, Gebre S, Hussein I and Regassa A (1992). Ticks, tick-borne diseases and their control in Western Ethiopia. Int. J. Trop. Insect Sci. 13:661-664.

Mekonnen S, Hussein I, Bedane B (2001). The distribution of Ixodid ticks in central Ethiopia. Onderstepoort J. Vet. Res. 68:243–251.

Morel P (1980). Study on Ethiopia ticks (Argasidae, Ixodidae) Republic of France, Ministry Of foreign affairs, French Vet. Mission, Addis. C. J. E. V. T. 12:332.

Nigatu K, Teshome F (2012). Population dynamics of cattle ectoparasites in Western Amhara National Regional State, Ethiopia. J. Vet. Med. Anim. Health 4(1):22-26.

Pegram G, Hoogsstraal H, Wassef HP (1981). Ticks Argasidae, Ixodidae of Ethiopia; Distribution, ecology and host relationship of species Infecting livestock. Bull. Entomol. Res. 71:339-359.

Solomon G, Kassa GP (1996). Studies on the development and Survival of *R.pulchellus* and *A.gamma* under field condition. Ethiopian Vet. J. 9:134-139.

Solomon G, Nigist M, Kassa B (2001). Seasonal variation of ticks on calves at Sebata in Western Shoa Zone. Ethiopian Vet. J. 7(1:2):17-30.

Solomon G, Sileshi M, Nigist M, Thomas C, Getachew T, Abebe M (2007). Distribution and seasonal variation of ticks on cattle at Ghibe Tolly in central Ethiopia. Ethiopian Vet. J. 11: 121–139.

STATA (2001). Stata Statistical Software, State Corporation, Texas, 77845, USA.

Surafel M (1996). Survey of tick species on four domestic animals in Tigray region. DVM thesis, Faculty of Veterinary Medicine, Debrezeit, Ethiopia.

Tamiru T, Abebaw G (2010). Prevalence of ticks on local and crossbred cattle in and around Asella town, southeast Ethiopia. Ethiopian Vet. J. 14(2):79-89.

Thrusfield M (1995). Veterinary epidemiology, 2nd Ed. Blackwell Science, London, UK, pp. 39-41.

Walker AR, Bouattour A, Camicas JL, Estrada- Pena A, Horak IG, Latif AA, Pegram RG, Preston PM (2003). Ticks of Domestic Animals in Africa: A Guide to Identification of Species, Bioscience Reports, Edinburgh, UK. pp. 1-205.