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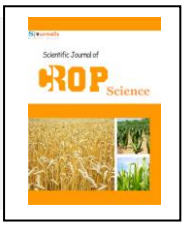

Original article

Identification of *Ixodide* ticks of cattle in and around Hararamaya district, Eastern Ethiopia

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ABSTRACT

We conducted a survey to determine the prevalence of *Ixodide* ticks, their predilection sites and relation to breed, sex, and age group of animals. A total of 560 animals were examined of which 186 (33.21%) found infested with one or more ticks. Among the total 1446 ticks collected three generas; 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* shows higher preference to axial, scrotum/ udder, and groin & belly. *B. decoloratus* species were found prominently on the back & neck. *R. evertsi evertsi* and *R. pulchelus* showed high preference to the under tail and peri-anal &vulva regions of the body. The male to female sex ratio of the collected ticks was found 1.96:1, showing higher proportion of male than their counter parts. 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 ($P>0.05$).

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1. 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, and Ghosh *et al*., 2007). Bekele T (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). There are 47 species of ticks found on livestock (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). *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 H, 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 toward these parasites. Moreover a species level identification will assist the diagnosis of different tick born diseases and their respective control programs. Underlining the facts mentioned above 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.

2. Materials and methods

2.1. Study area

Haramaya district is located in the eastern Hararghe zone of Oromiya region, Ethiopia, 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 1600-2100m above sea level at 9^0 26N latitude and 42^0 3E longitudes with the mean annual temperature and relative humidity of 18^0c and 68% respectively. The area receives an average annual rain fall of approximately 900mm, with a bimodal distribution pattern, picking in mid April and mid August.

2.2. 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.

2.3. Sampling and sample size determination

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 was recorded 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.

$n=1.960\ Pexp\ (1-Pexp)/\ d^2$ Where, n= required sample size Pexp= expected prevalence d= desired precision

Though, the required sample size was computed to be 384 a total of 560 animals were examined to increase the precision of our investigation.

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 in to universal bottles containing (10%) formalin. The bottles were labeled according to the predilection sites and sampled animal. All collected ticks 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 was recorded at the time of collection.

2.5. 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 ($\chi 2$) test was used to assess if there was a statistically significant difference in tick infestation with in different groups. For this analysis P-value less than 0.05 was considered significant.

3. 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 three genera and five 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 *R.pulchellus* (6.64%) was the list (Table 1). The higher proportion of ticks 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, peri-anal &vulva, back &neck, dewlap& head, groin & belly, under tail, ear, and udder/scrotum. Different species of ticks found to prefer different predilection sites where *A.variegatum* and *A.cohaerens* found most predominately in the axial, groin &belly, and udder/scrotum whereas, *R.evertsi evertsi* and *R.pulchellus* found predominating in the under tail and peri-anal &vulva and *B.decoloratus* found abundantly in the back & 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 group of animals examined infestation 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).

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%)
Rh. evertsi evertsi	212 (14.66%)

4. Discussion

In this survey a total 1,446 ticks were collected from a total of 560 local and cross breed animals yielding an overall prevalence of 33.21%. And this finding is in agreement with the findings of Belew (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 influenced by rainfall, altitude and atmospheric relative humidity Pegram *et al*., (1981).

Table 2

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

Sites	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**			
	A.variegatum	***A.cohaerens***	***R.evertsi evertsi***	***R.pulchellus***	***B.decoloratus***
Axial	195 (34.69%)	56 (46.66%)	5 (2.35%)	-	5 (1%)
Peri-anal &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&Head	-	-	4 (1.88%)	-	30 (6.57%)
Groin&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&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.evertsievertsi	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

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

	Total no of animals examined	Total no of animals infested	Total number of tick collected
Sex			
Male	273	85 (31.11%)	695
Female	287	101(35.19)	751
Breed			
Local	380	167(58.18%)	1231
Cross	180	19 (10.55%)	215
Localities			
Ifa-oromia	115	38 (33.04)	549
Tujgabisa	122	48 (39.34)	482
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
>3 year	274	97 (35.40%)	653

*P>0.05 for sex, age and localities whereas P<0.05 for Breed group

Three genera of hard ticks were identified, namely *Amblyoma*, *Boophilus* and *Rhipicephalus*. *A. variegatum, A. cohaerens, R. evertsi evertsi R. pulchellus and B. decoloratus* was 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 *A.variegatum* is the most common and widely distributed cattle tick in Ethiopia (Morel, 1980; Pegram *et al,* 1981 and Assefa, 2004). It has a great economic importance, because it is an efficient vector of *Cowderia ruminatum* (*E.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).

Boophilus 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) and Solomon *et al*., (2001).

Rhipicephalus 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 throughout 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).

Amblyoma 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 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, 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 (Manueri and Tilahun, 1991).

Rhipicephalus 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 (south east 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*, *Boophilus decoloratus*, *R. evertsi evertsi* and *R. Puluchulus* are in agreement to the earlier works of Kaiser *et al*., (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; Tamiru *et al*., 2010).

With regard to predilection site for attachment, different tick species shows different site preferences. *A.varirgatum* and *A.cohearens* 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 a*l., (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.

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