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Distribution of Ixodid Ticks on Cattle in and Around Holeta Town, Ethiopia

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Abstract: The study was conducted from October, 2010 to March, 2011 in Holeta and Adaberga dairy farms and their surrounding kebeles in Ethiopia with the objectives of determining the ixodid tick species prevalence in the area, assessing the difference in infestation among the cattle breeds and farming system and evaluating the predilection site of ticks on the host. Out of the total of 1209 cattle examined, 310 (25.64%) were found to be infested by one or more tick species. About 1831 ticks were collected and subjected to genus assignment then they were grouped into four genera; namely *Amblyomma, Rhipicephalus, Boophilus* and *Hyalomma* and five species were identified. The relative prevalence of each species was *Amblyomma variegatum* (45.49%), *Rhipicephalus evertsi evertsi* (29.29%), *Boophilus decoloratus* (18.13%), *Amblyomma coherence* (5.02%) and *Hyalomma marginatum rufipes* (1.86%). The prevalence of tick infestation was found to be significantly different ($P<0.05$) among the three breeds with highest prevalence in Local breed (44.96%) than both Cross (15.83%) and Jersey (8.50%) breed. Similarly, tick infestation was significantly ($P<0.05$) higher in cattle kept under extensive production system (45.40%) than in those kept under semi-intensive (10.06%) farming system. The present information on the common tick species contributes its part in the development of best control strategies of tick and tick borne diseases in the study area.

Key words: Adaberga · Cattle · Holeta · Ixodid Tick · Prevalence

INTRODUCTION

Ticks are very important and most common ectoparasites of mammals, birds and reptiles worldwide [1]. They are dioecious having separate sex [2]. Based on the number of hosts required to complete their development during their life cycle they can be classified as one-host, two-host and three-host ticks [3].

Ticks also have adverse effect on livestock in several ways and parasitize a wide range of vertebrate hosts and transmit a wide variety of pathogenic agents than any other group of arthropods [4]. They transmit protozoa, bacterial, rickettsial and viral diseases. They down grade hide and skins quality and reduce milk and wool production, reduce productivity and increase susceptibility to the other diseases [5]. 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 [6].

In Ethiopia, ticks are the most important of all ectoparasits. The economic loss incurred when they infest livestock particularly, cattle are enormous [7]. In spite of the aforementioned prevailing situation and the presence of a number of problems due to ticks in Ethiopia, there is paucity of well-documented information on the occurrence of ticks in the study area. Therefore, this study was designed with the objectives of determining the prevalence of Ixodid ticks, evaluating the tick control strategies under different farming systems and farm animals, assessing the risk factors of tick infestation in the study animals and recommending best tick control options in the area.

MATERIALS AND METHODS

Study Area: The study was conducted in Holeta and Adaa berga dairy farms of Holeta Agricultural Research Center and their surroundings. Holeta is located 45km west of Addis Ababa at altitude 2400 meter above sea level. In these areas the rainfall pattern is bimodal, with a

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short rainy period from February to April and a long rainy season from mid- June to September. The annual temperature ranges between 18°C to 24°C and the rainfall of the area ranges from 1000 to 1100 mm. The predominant soil type is vertisol and semi intensive farming is a common practice in both farms (Holeta agricultural research center).

Study Animals: The study animals were (Holstein Frisian * Boran) cross breeds at Holeta dairy farm, pure Jersey breed at Adaa berga dairy farm and the Local breed in their surroundings at the hand of the farmers. The Holeta and Adaa berga dairy farms were managed in semi-intensive while the surrounding was managed extensively.

Study Design and Sampling Technique: A cross-sectional study was conducted from October, 2010 to March, 2011 to determine the prevalence of ticks. All the animals selected as sampling unit were checked for any tick infestation and the level of infestation based on the number of ticks found on the animal during the study period were recorded.

Sampling Method and Determination of Sample Size: The farms and surrounding kebeles were selected based on the judgments of the researchers to asses ixodid ticks present and infestation in the two dairy farms and their surroundings. During the study period, cattle were randomly selected. To calculate the total sample size, the following parameters were used: 95% confidence interval (CI), 5% desired level of precision and with the assumption of 50% expected prevalence of ixodid ticks, the sample sizes were determined using the formula given in Thrusfield [8].

$$n = \frac{1.96^{2*}\,Pexp(1\text{-}Pexp)}{d^2}$$

n = required sample size, Pexp = expected prevalence, d = desired absolute precision

Using the above formula the sample size was known to be 384 but, to increase the precision of our work the sample size was increased to 1209.

Study Methodology: Adult ticks were collected from the eight body regions of cattle from farms and their surrounding kebeles. The entire body surfaces of the cattle were thoroughly examined for the presence of ticks. The collected ticks were put in a universal sampling bottle containing 70% ethanol. Ticks were carefully removed from the host for identification using quality steel forceps. Collected adult tick from each body region was kept separately for identification in separate sample bottle. Then tick were brought to the veterinary parasitological laboratory of Holeta agricultural research center for identification using a stereomicroscope and following standard identification procedure [3, 9]

Data Analysis: The raw data that were recorded from this study were entered in to Microsoft excel data base system and using SPSS version 16 computer program, data were summarized and analyzed. Chi-square (χ^2) test was used to determine the variation in infestation prevalence between different peasant associations. A 5 % significant level was used to determine whether there were significant differences in the parameters measured between the groups.

RESULTS

Out of the total sample of 1209 cattle, 310 were found to be infested by one or more tick species. A total 1831 Ixodid ticks were collected among which four genera and five species of ticks were identified. *Amblyomma* was the most abundant (50.5%) genus and *Hyalomma* was confirmed to be the least prevalent (1.85%) tick genus (Table 1).

The 1831 collected ticks were subjected to species assignment, accordingly *A. variegatum* was the highest prevalent tick species (45.49%) and *H. marginatum rufipes* was least prevalent (1.86%) tick species (Table2)

Each tick species tend to prefer a site of attachment on the animal body. The most favorable predilection site for *Amblyomma* species and *H. marginatum rufipes* were known to be the ventral body part (udder/scrotum, axial and groin) and *B. decoloratus* was mostly collected from

Table 1: Prevalence of tick genera in Holeta and Adaberga dairy farms and their surrounding kebelesthe study area

Genus	Prevalence (%)
Amblyomma	50.5
Rhipicephalus	29.49
Boophilus	18.13
Hyalomma	1.85

Table.2: Distribution of tick species

Tick species	Total count and prevalence (%)
A. variegatum	833 (45.49)
Rh. evertsi evertsi	540 (29.29)
B. decoloratus	332 (18.13)
A. coharence	92 (5.02)
H. marginatum rufipes	34 (1.86)

Table 3: Distribution tick species in different body region of cattle

	Tick species collected from different body part									
Attachment site	*A. variegatum*		*Rh. evertsi ev.*		*B. decoloratus*		*A. coharence*		*H. marginatum rufipes*	
Ear	-	-	-	-	6	-	-	-	-	-
Scrotum/udder	244	29.29	22	4.07	15	4.52	25	27.13	15	44.12
Groin & belly	238	28.57	2	0.37	16	4.82	29	31.52	13	38.23
Dewlap & head	-	-	10	1.85	27	8.13	-	-	-	-
Back & neck	-		-	-	257	77.41	-	-	-	-
Vulva & per anal	-		147	27.22	2	0.602	-	-	-	-
Under tail	3	0.36	345	63.89	5	1.51	1	1.09	-	-
axial	348	41.78	14	2.59	4	1.2	37	40.21	6	17.65

Table 4: Total animals examined and infested by ticks

Site	Examined	Infested	χ^2- value	p-value
Holeta dairy farm	327	42 (12.84%)	2.037	0.000
Holeta surrounding	302	125 (41.40%)		
Adaa berga dairy farm	349	26 (7.45%)		
Adaa berga surrounding	231	117 (50.65%)		
Total	1209	310 (25.64%)		

Table 5: Tick infestation in relation to breed

Breed	Examined	Infested	Prevalence (%)	χ^2- value	p-value
Local	496	223	44.96	1.697	0.000
Cross	360	57	15.83		
Jersey	353	30	8.50		

Table 6: Tick infestation in relation to farming system

Farming system	Examined	Infested	Prevalence (%)	χ^2- value	p-value
Extensive	533	242	45.40	1.953	0.000
Semi extensive	676	68	10.06		

dewlap, head and back but also present on the rest of body parts. *Rhipicephalus evertsi evertsi* was collected most often in under tail, vulva area and peri anal region (Table 3).

The highest prevalence (50.65) of tick infestation was observed in Adaa berga surrounding kebeles followed by Holeta surrounding kebeles (41.40), whereas the lowest prevalence of tick infestation was seen in Adaa berga dairy farm with a specific prevalence of 7.45. Statistical analysis of the infestation rate of ticks showed significant difference ($P< 0.05$) among the different farming systems. (Table 4).

This study revealed that the prevalence of tick infestation in Local breeds was 44.96% and the specific prevalence of tick infestation were found to be 15.83% and 8.50% in Cross and Jersey breeds respectively. There were significant difference ($P<0.05$) in the prevalence of tick infestation among the three breeds of animals during out survey (Table5).

Cattle tick infestation was significantly ($P<0.05$) higher in cattle kept under extensive production system (45.40%) than those kept under semi-intensive (10.06%) farming system (Table 6).

DISCUSSION

The most abundant tick species in Holeta and Adaa berga dairy farm and their surrounding was found to be *A. variegatum* (45.49%). The reason could be attributed to fact that tick is very abundant in the Western central part of Ethiopia and this situation could be further explained by the fact that *A. variegatum* is the most widely distributed cattle tick in Ethiopia [10, 11].

Rhipicephalus evertsi-evertsi was found to be the second most abundant (29.29%) tick species in this study. The native distribution of *R. evertsi evertsi* in Ethiopia seems to be connected with middle height dry savannas and steppes in association with Zebra and ruminant and it is widely distributed throughout Ethiopia [10]. This tick species shows no apparent preference for particular altitude, rainfall zones or seasons [11]. The result of the current research was in line with Belete [13] in Nekmet awarja, Tamru [14] in Assella and Yussen [15] in Bako with prevalences of 26.75, 22 and 21.5% respectively.

Boophilus decoloratus is confirmed to be the third abundant tick species (18.13%) in the study area. Tamru [14] has reported a similar result at Assella with prevalence 18.0%. Our result was in line with researches conducted in many parts of Ethiopia such as in Rift Valley region of Ethiopia [12], Hararghe [16] and Bale [17]. Morel [10] stated that *B. decolaratus* is often collected in Ethiopia and does not seem abundant anywhere. This tick species is abundant in wetter highlands and sub-highlands receiving more than 800mm rainfall annually [11].

Amblyomma cohaerence was confirmed to be distributed with prevalence of 5.02% in the study area. In a tick survey conducted in western Ethiopia, *A. cohaerence* was founded to be the most prevalent in Mezan Teferi [18] and Jimma [19] with a prevalence of 50.5% and 83.1%, respectively.

Hyalomma marginatum rufipes was the least abundant tick collected and represent only 1.86% of the total counts. Yussen [15] in Bako and Tamru [14] in Assella have reported a prevalence of *H. marginatum rufipes* similar to our finding (1.2% and 2.5% respectively). This low prevalence could be justified by the fact given by Hoogstraal [20] who stated that *H. marginatum rufipes* is widely distributed in the most arid parts of tropical Africa, receiving 250 to 650 mm annual rainfall and rare in the western highland area. In Ethiopia, altitude is often between 1000-2000m making the presence of this parasite to be very rare.

Ticks are known to be distributed in different parts of the host body. In this study the infestation rate of ticks in the neck and back was 77.41%, udder/scrotum (63.89%), axial (40.21) and groin and belly (38.23). Factors such as host density, interaction between tick species, time and season and inaccessibility for grooming determine the attachment site of ticks [12]. The predilection sites found in this study were in line with those reported by Siyoum [21] and Behailu [22] in their study conducted in North Wollo zone and Asella, respectively.

The results of the present study would have contribution to the paucity of information on tick infestation of cattle of different breeds that are managed under different production systems in Holeta and Adaa berga dairy farm and surrounding. Study revealed that the presence of tick infestation in Local breeds were very high with a prevalence of 44.96% (n=223) whilsy in Cross breeds and Jersey the prevalences were 15.83% (n=57) and 8.50% (n=30), respectively. The significant variation in tick infestation of cattle of different breeds in the current research might be attributed to differences in management systems, lack of supplementary feeding to local cattle breeds, or lack of control measures against tick on local cattle breeds. Furthermore, it can be assumed that it might be due to lack of interest of farmers about local cattle as well as taking more care to Cross breed than Local cattle.

Cattle tick infestation was significantly higher ($P<0.05$) in cattle kept under extensive production system with a prevalence of 45.40% (n=242) than on cattle kept under semi-intensive farming system where the prevalence was 10.06% (n=68). This situation could be hypothesized that regular washing of barn and animal, regular treatment of animals with acaricides will reduce the susceptibility of tick infestation in semi intensive animal whereas extensive cattle are move anywhere for grazing, so susceptibility of tick infestation is higher.

CONCLUSION

The present study showed high prevalence Ixodid tick species in Holeta and Adaberga dairy farms and their surrounding kebeles The important and abundant tick species investigated in this research were *Amblyomma variegatum*, *Rhipicephalus evertsi-evertsi*, *Boophilus decoloratus, Amblyomma cohaerence* and *Hyalomma marginatum rufipes*. However, the attentions given to the infestation were not sufficient and the lack of available information on tick species and the demerits behind tick infestation aggravates the infestation of the livestock population in the area by ticks. In the meantime it was noted that there were a little attempts made to control the infestation of tick.

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