Full Length Research Paper

Study on cattle tick species frequency distribution in and around Jimma province of Ethiopia

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The prevalence and abundance of tick species of cattle were studied in and around Jimma town of South Western Ethiopia from November, 2015 to March, 2016. The overall prevalence of tick in cattle was about 88.8%. A total of 4579 adult ticks were collected from 384 cattle. Of the total tick collected, Amblyomma and Rhipicephalus constitute 76.7 and 23.3%, respectively. Three species belonged to the genus Amblyomma and two species belong to Rhipicephalus. The species encountered were Amblyomma cohaerens (40.68%), Amblyomma variegatum (33.58%), Rhipicephalus decoloratus (19.98%), Rhipicephalus evertsi evertsi (3.32%) and Amblyomma gemma (2.42%). The study therefore, revealed that A. coherence and A. variegatum were the most prevalent cattle tick species in and around Jimma. A statistically significant difference (p<0.05) was observed in tick burden between cattle in good body condition and those in poor body condition. That is, cattle with poor body condition had higher tick burdens than good body condition. The infestation level by age and sex were also statistically significant (p < 0.05). As the age of animals increase, tick burden also increases. Similarly, the female animals carried more ticks than males. The favorable predilection site of Amblyomma species were the scrotum (udder) and perineum, while Rhipicephalus were more around ano-vulva, udder and the tail area. Ticks are important ectoparasites in and around Jimma and cause huge economic losses to the livestock industry. Much attention has to be given to control ticks by the use of acaricides, integrated with other techniques to minimize their effect.

Key words: Ethiopia, cattle, Jimma, prevalence, ticks, burden.

INTRODUCTION

Cattle are a primary resource of earning for people of Ethiopia (CSA, 2002). However, ecto-parasites including ticks are the major contributing factors that impact health and production of cattle (Bossena and Abdu, 2012). Ticks and tick born diseases (TBDs) are widely distributed particularly in tropical and subtropical countries, responsible for tremendous loss in cattle production (Kettle, 1995; Fantahun and Mohamed 2012). In Ethiopia, ticks ranked first among ecto-parasites (Walker et al., 2003).

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The main ticks found in Ethiopia include *Amblyomma, Haemaphysalis, Hyalomma* and *Rhipicephalus*. The most important and wide spread tick species are *Amblyomma variegatum* (vector of disease, *Ehrlichia ruminantium* and *Theileria mutans*) and *Rhipicephalus decoloratus* (vector of the disease, *Anaplasm a marginale* and *Babesia bigemina*) (Abebaw, 2004).

Ticks are blood feeding ectoparasites which are capable of transmitting disease-causing pathogens to their hosts if they are infected. Ticks do not only transmit diseases but also cause damage to the skin of their hosts resulting in irritation (tick worry) of hosts, lower productivity, blood loss and udder damage, while they also inject toxins into host animals. In addition, ticks carry numerous diseases that affect as much as 80% of the worlds’ cattle population. Therefore, ticks can lead to significant economic losses. Economic losses attributable to ticks comprise of decreased productivity and mostly losses due to costs of controlling both tick infestation and tick-borne diseases (Bloemfontein, 2016).

In Jimma zone, cattle are always under the risk of tick infestation and tick born disease challenges. There are different methods for control of ticks infestation in the area, these includes removal of ticks and acaricides treatments. But still the challenge of tick on animals was seen in the study area, because the control methods practiced in the area had not covered wide area of the households, it is only for those cattle presented to the veterinary clinics (from general view in the area during the pilot study). Hence, this study was attempted with the objectives: To identify the main tick species infesting cattle and their distribution in and around Jimma town and to assess associated risk factors with tick infestation.

**Research question**

1. What is the prevalence of the ticks?
2. What are the types of ticks infesting the cattle in and around Jimma?
3. What factors are associated with tick infestation?

**MATERIALS AND METHODS**

**Study area, population and design**

The study was conducted in and around Jimma town which is about 346 km South West of Addis Ababa and located between 7° 13' to 8° 56' North latitude and 35° 52' to 37° 37' East longitude. It lies in altitudinal range of 880 to 3359 m above sea level (m.a.s.l). The average annual rainfall is 1200 mm. The weather condition is hot and humid with temperature fluctuation between 7 and 30°C. The total animal population of the Jimma zone is about 4,322,761 in 2015. Cattle population is about 3,213,548. Majority of these cattle's were kept under extensive management system which are highly prone to tick infestation (According to the Jimma city, Finance and Agriculture Office).

A cross sectional study design was conducted to identify important tick species infesting cattle in and around Jimma town of Ethiopia during November, 2015 to March, 2016. Age, sex and body condition of the animal was considered as variables on the prevalence and infestation rate of ticks. Body condition scoring (BCS) refers to the relative amount of subcutaneous body fat or energy reserve in the cow. Poor body condition in cattle is a condition of cattle that is characterized by deep cavity with no fatty tissue under skin in the area of tail head. Skin is fairly supple but coat condition is often rough and spine prominent with horizontal processes of sharp of loin. Whereas, good body condition is characterized by fat accumulation over whole area of tail head and smooth skin but pelvis can be felt and end of horizontal process can only be felt with pressure in area of loin with only slight depression in loin.

**Sample size determination and sampling method**

The sample size was determined by using the formula given by Thrusfield (2005) with expected prevalence of 50%, at 95% level of significance and 5% absolute precision. Accordingly, a total of 384 cattle were sampled to know which species of ticks were prevalent in the area.

The sampling techniques used were a multiple stage sampling methods. Simple random sampling was used in each stage. Jimma town has about 17 kebele. From these, 6 kebeles were selected, and then from each kebele, the households were also selected. Here, the sampling frame was the numbers of households in each kebele. Finally, each individual cattle were selected from each household.

**Investigation procedure**

An investigation procedure requires both field works and laboratory investigation of collected tick samples. Ticks were collected from cattle and transferred into universal sampling bottle containing 70% ethanol (Okello et al., 1999; Walker et al., 2003). During the study time, different body region of the cattle were considered for tick collection. These includes head, dewlap, brisket, belly, back, udder or scrotum, ano-genital, legs, tail, perineum, ear and hump were thoroughly assessed. Ticks were removed from the cattle skin whilst retaining their good morphological condition for identification using steel forceps after application of a drop of 70% ethanol to the site where the mouth of ticks were imbedded.

The collected ticks from each body regions were kept separately for identification in separate sample bottles containing 70% ethanol until identification was done according to Matthysse and Colbo (1987). Finally, ticks were identified, counted and recorded up to species within 5 days of collection using stereomicroscope (Hendrix, 1998).

**Data analysis**

Analysis of obtained data was done by Chi square ($\chi^2$), ANOVA and independent samples test were used to test the association between ticks infestation with different factors (age, sex and body condition score). For this analysis, SPSS, version 20 was used (SPSS INC. Chicago, IL).

**RESULTS**

The study was conducted from November, 2015 to March, 2016. The overall prevalence of tick in cattle was about 88.8%. A total of 4579 adult ticks, comprising two were
genera and five species were collected from 384 cattle (Table 1). The genera of ticks encountered *Amblyomma* and *Rhipicephalus* with relative infestation rate of 76.70 and 23.3%, respectively. The five species identified were *Amblyomma cohaerens*, *Amblyomma variegatum*, *Amblyomma gemma*, *Rhipicephalus decoloratus* and *Rhipicephalus evertsi eversi*.

Frequency distribution wise, *A. cohaerens* was the top most prevalent tick species with prevalence of 40.69%, followed by *A. variegatum* with prevalence of 33.59%, *R. decoloratus* with prevalence of 19.98%, *R. evertsi eversi* and *A. gemma* with lower prevalence of 3.32 and 2.42%. The male to female ratio recorded was 1:95 for *A. cohaerens*, 1:73 for *A. variegatum* and 0:01 for *R. decoloratus* (Table 1).

Cattle with poor body condition had significantly higher tick burdens than those with good body condition (P=0.003, X²=11.32) (Table 2). Age wise infestation level was statistically significant (P<0.005), the mean ticks were 10.48/head in cattle of ≤3 years and 13.11/head in cattle of >3 years, as the age of cattle upturn ticks burden also increases. Similarly, the female cattle also carried more ticks than males, significant difference (P=0.0032) was found (Table 3).

**DISCUSSION**

Identifying and knowing the prevalence of the ticks is important for the control of tick burden and tick born disease. Comparing the present studies with the previous study also has a role in identifying the status of the tick infestation in the study area (Table 4).

The abundance of *A. cohaerens* in this study area was due to geographic location and humid climatic condition of South Western part of Ethiopia and also due to its being relatively active throughout the year. This result agreed with previous studies on survey of the tick species in Jimma zone, western Ethiopia conducted by Pegram et al. (1981), Abebaw (1994), De Castro (1994). They found high prevalence of *A. cohaerens* in their study. *A. variegatum* was the second most abundant tick species. It was the most widely distributed cattle tick in Ethiopia, as reported by the survey in Assosa (Bosssena and Abdu, 2012) with prevalence 75.91%. *Amblyomma* ticks are vectors of cowdriosis (heart water) of cattle and small ruminents. Thirteen species of *Amblyomma* are known to be able to transmit cowdriosis (Pawlos and Derese, 2013).

**Table 1.** Species and sex wise proportion of tick collected from cattle of Jimma town of Ethiopia.

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Male of Ticks</th>
<th>Female of Ticks</th>
<th>Male to female ratio</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent (%)</td>
<td>Number</td>
<td>Percent (%)</td>
</tr>
<tr>
<td><em>A. cohaerens</em></td>
<td>1231</td>
<td>40.69</td>
<td>632</td>
<td>20.63</td>
</tr>
<tr>
<td><em>A. variegatum</em></td>
<td>975</td>
<td>33.59</td>
<td>563</td>
<td>18.20</td>
</tr>
<tr>
<td><em>R. decoloratus</em></td>
<td>7</td>
<td>2.42</td>
<td>908</td>
<td>28.91</td>
</tr>
<tr>
<td><em>R. evertsi evertsi</em></td>
<td>100</td>
<td>3.32</td>
<td>52</td>
<td>1.67</td>
</tr>
<tr>
<td><em>A. gemma</em></td>
<td>82</td>
<td>2.79</td>
<td>29</td>
<td>0.92</td>
</tr>
<tr>
<td>Total</td>
<td>2395</td>
<td>78.18</td>
<td>2184</td>
<td>69.97</td>
</tr>
</tbody>
</table>

**Table 2.** Prevalence of cattle tick species on the basis of body condition.

<table>
<thead>
<tr>
<th>Body condition</th>
<th>No. of examined cattle</th>
<th>No. of infested cattle</th>
<th>Infestation rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>146</td>
<td>135</td>
<td>92.50</td>
</tr>
<tr>
<td>Medium</td>
<td>128</td>
<td>118</td>
<td>92.18</td>
</tr>
<tr>
<td>Good</td>
<td>110</td>
<td>86</td>
<td>78.18</td>
</tr>
</tbody>
</table>

**Table 3.** Tick burden in relation to age, sex and body condition of the cattle.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Body condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3 year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3 year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>190</td>
<td>Poor</td>
</tr>
<tr>
<td>Female</td>
<td>194</td>
<td>Medium</td>
</tr>
<tr>
<td>Poor</td>
<td>146</td>
<td>Good</td>
</tr>
<tr>
<td>Medium</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4579</td>
<td></td>
</tr>
</tbody>
</table>
parts of the country such as Assosa, Bahir Dar and Nekemte. The result of this study (19.98%) disagrees with finding of Alekaw (1998) at Metekel Ranch, Ethiopia showing prevalence of 5.7%. This may be due to the difference in geographical location and altitude factor. This tick species is abundant in wetter highland and sub-highlands receiving more than 800 mm rainfall annually (Pegram et al., 1981).

3.32% *Rhipicephalus evertsi evertsi* was also reported in Bahr Dar (Mesele, 1989), Jimma (Abebaw, 2005). Morel (1980) mentioned that the native distribution of *R. evertsi evertsi* in Ethiopia seems to be connected with middle highland, dry savannas and steppes in association both Zebra and ruminant. But this tick species shows no apparent preference for particular altitude, rainfall zones and seasons (Pegram et al., 1981), so appears to occupy a wide range of climatic and ecological condition. *Rhipicephalus* ticks are the main vector of bovine babesiosis and ovine ehrlichiosis. *R. evertsi-evertsi* is a possible vector of *Babesia, Rickettsia* and *Theliera* (Pawlos and Derese, 2013). The least finding of *A. gemma* (2.42%) is similar to the pervious finding (De Castro, 1994). This may be due to environmental condition which is not favorable to their survival, humid and highland nature of the area. This species of ticks is confined to semi arid lands of Harar province (Pegram et al., 1981).

The male to female sex ratio of the ticks were less than females (Solomon et al., 2001; Solomon et al., 2007; Mesele, 1989). In all cases, except *R. decoloratus*, males outnumbered females. This is due to fully engorged female ticks drop off on the ground to lay egg while the male tends to remain on the host before dropping off and hence males normally remains on the host longer than females (Solomon et al., 2001).

### Conclusion and recommendation

The present study results presented frequency distribution of five species of ticks belonging to two genera of ticks. Ticks were found infesting whole body of the cattle. However, ticks existences were more on udder/scrotum, perineum, brisket, neck, ano-vulva and under tail. The sexual dimorphism in ticks is very wide and is not species specific. Apart from this, *A. cohaerens* has been found as the most prevalent species followed by *R. decoloratus, R. evertsi evertsi,* *A. gemma* and *R. evertsi evertsi*.
ano-vulva and dewlap. The distribution limits of ticks are not static but are determined by a complex interaction of factors such as climate, host density, host susceptibility and grazing habits. Further investigations on seasonal dynamics of tick population are essential for the continuous understanding of improved controls application. At the same time, it is better to use acaricides for the control of ticks throughout the area simultaneously in all households.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

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REFERENCES


