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Prevalence of Hard Ticks Infesting Cattle in Mokoy District of Gambella Regional State, Ethiopia

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Abstract: A cross sectional study was conducted to determine the prevalence, the identity of hard ticks (Ixodid) infesting cattle and their preferred sites on body parts of cattle in and around Mokoy district in Gambella regional state. Adult ticks were collected from 384 Abiggar breed of cattle which were kept under extensive management system. From the total of 384 cattle examined for ixodid ticks 320(83.3%) of the animals were found to be positive for one or more ticks. A total number of 2000 adult ticks were collected from half body parts of infested cattle and identified at genus level. From infested cattle four genera *(Amblyomma*, *Hyalomma, Rhipiciphalus* and *Boophilus)* with relative infestation rate of 32.8%, 19.1%, 12.7% and 35.5% respectively were identified. The study also found that most infested body parts of the cattle were brisket (20.1%) followed by genital and anal (19.7%). Neck and head (19.4%), under and scrotum (17.5%), belly (17.1%), legs (6.2%). Age wise ticks infestation was (85.5%) in above 5 years old and (79.6%) in below 5 years old cattle. The infestation level of ticks was 90.9%, 86.7% and 75.3% in medium, poor and good body condition respectively. The study revealed that widespread occurrence of ixodid ticks of cattle in the study area. Thus improved management practices and well-coordinated control intervention against ticks is required.

Key words: Abiggar Breed · Ixodid Tiks · Mokoy · Gambella · Ethiopia

INTRODUCTION

Tick and Tick-borne disease are widely distributed throughout the word particular in tropical and sub-tropical countries, which cause a tremendous economic importance in livestock production [1]. In most parts of Africa including Ethiopia, ticks and tick-borne disease, together with tsetse and trypanosomes are economical important diseases [2]. In Ethiopia, ticks occupy the first place amongst the external parasites by the economic loss they incurred when they infest livestock particularly cattle [3]. Ticks are important vectors of diseases like babesios, anaplasmosis, theileriosis, ehrlichiosis etc…in domestic ruminant. They are known to exacerbate nonspecific disease symptoms like anemia, toxicosis and paralysis [4]. In Ethiopia ticks are common in all agro ecological zone of the country [5]. Study on ticks infesting livestock in their natural conditions is useful for understanding the host-parasite relation and the seasonal variation of ticks [6]. In addition specific predilection site determination of ticks is essential for the development of effective control strategy against ticks and ticks-borne diseases [7].

Ticks belong to the classifications such as: arthropod, arachnid and order acari. The families of ticks parasitizing livestock are categorized into two, *Ixodidae* (hard ticks) and *argasidae* (soft ticks). Though, sharing certain basic properties they differed in many structures, behavioural, physiological feeding and reproduction pattern [8].

Hard ticks get their name from tough dorsal shield or plate called the scutum present on all mobile stage of the ticks. The scutum on the larva, nymph and female ticks covers dorsal anterior third to half of the body. By contrast, the scutum on a male ticks covers almost the entire dorsal surface and as result engorgement during feeding not possible in male ixodid ticks. The scutum differs in colour, shape and others characteristics (ex. Presence or absence of simple eyes) among different ticks' genera. In some ticks, ornate or patterned markings may be present that can aid in identification [9].

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Even though there are a number of studies on species composition, prevalence and distribution of ixodid ticks of cattle in many part of Ethiopia, there is no study made so far on ticks infecsting cattle in Mokoy woreda in Gambella. The objectives of this study were to assess the prevalence of major hard ticks and identify them to generic level.

MATERIALS AND METHODS

Study Area: The study was conducted in Mokoy district which is located 130 KM from Gambella town. It occupies a large geographical area in the western part of Gambella region. The district account s for 2, 782.72 Km^2 of land, out of the total land mass of the region. It has latitude and longitude of 80° 15'N 34°_35'\8.250°N, 34, 583°E respectively, with hot and humid climate where the annual rain fall range is about 961-2001 mm. The area experience bimodal type of rainfall classified as short rain season (from July to September) and main rain season from March to April. The average temperature ranges from 27-33°C. Maximum temperature varies from 36°C in February to 40°C from March to mid-April [10].

Study Animals: The Study was conducted from October 2018 to May 2019. Tick samples were collected from local cattle breed (Abiggar) of all age and sex as well as different body condition. Following the recommendations of Okello-Onen, *et al*. [12] nine predilection sites (ears, head, dewlap/neck/brisket, forelegs, belly, rear legs, escutcheon, tail and shoulder/back/side) of ticks were carefully examined.

Study Design and Sample Collection: The study was conducted on a total of 384 cattle. The animals were selected and sampled using random sampling technique. Ticks were collected from different parts of the body and identified to generic level. A total of 2000 adult ixodid ticks were collected manually and with the help of thumb forceps without causing damage to the mouth part and other body regions. All visible attached adult ticks of all species were collected from different body regions of each animal. The collected adult ticks from different body regions and were kept separately in to a universal sample bottle containing 70% alcohol (ethanol) for identification [12]. The identification was done based on morphological and structural differences of the adult ticks of each genus were identified under stereo microscope using the standard identification procedure described by Okello- Onen, Hassan and Essuman [12].

Sample Size Determination: The sample size were determined by assuming the expected prevalence of 50%tick infestation as there was no previous research conducted in the study area. The desired Sample size for the study was calculated using the 95% confidence interval 5%absolute precision [11]. Therefore, total sample sizes of 384 cattle were used to study ticks of cattle in the study area.

$$N = \frac{1.96^2 = p\exp(1 - p\exp)}{D^2}$$

wWhere n = required sample size; p exp =expected prevalence; and d=desired absolute precision = 0.05.

Ticks Sample Collection and Parasitological Techniques: Tick prevalence survey was carried out at Mokoy district in purposively selected PAs based on the cattle population and accessibility. Then tick sample were taken randomly from 384 animals.

Data Analysis: The data collected were entered and managed in Microsoftexcel. An intercooled SPSS 20 version software [13] STATA Corporation (2001) statistical program was employed for the data analysis. The overall prevalence of tick was determined by dividing the number of positive animals by total sample size and was expressed as a percentage. Chi-square (X2) test was used to assess if there was a statistically significant association in tick infestation between ages, sex, breeds and body conditions.

RESULTS

Prevalence of Ticks: Out of 384 animals examined in the current study, ticks were found on 320 with an overall prevalence of 83.33% (Table 1). The numbers of ticks collected from the cattle dominated by males. From total tick collected genera male accounts 71.85% (1437) and female 28.15 % (563) (Table 1). This shows that infestation by male tick was found to be greater than female tick. The male tick to female sex- ratios accounts genus *Boophilus* (4.07%) *Amblyomma* (3.85%), *Rhipicephalus* (1.3%) and *Hyalomma* (1.15%) in a decreasing order.

The infestation of ticks in adult cattle (> 5 year age) was 84.7% greater than those young age cattle of < 5 years (81.0%).

The infestation of tick in male and female animals shows that higher prevalence observed in male animals (96.2%) than female (71.8%). This difference was statistically significant. This was strongly significant with tick infestations (Table 2).

Table 1: Distribution and sex ratio of adult tick genera in the study area

Tick genera (%)	Total count	Prevalence %	Sex		Ratio (M: F)
			Female	Male	
Ambylomma	655	32.8	135	520	3.85:1
Hayalomma	382	19.1	178	204	1.15:1
Boophilus	710	35.5	140	570	4.07:1
Rhipicephalus	253	12.6	110	143	1.3:1
Total	2000	100.0	563	1437	2.55:1

Table 2: Association of potential risk with prevalence of ticks

Risk factors	Group	No.	Total	p – value
Sex	Male	175	182	0.000
	Female	145	202	
Total		320	384	
Age (yr)	<5 (young)	115	142	0.346
	>5 (adult)	205	37	
Total		320	384	
Body	Good	121	154	0.023
Condition	Medium	98	110	
	Poor	101	120	
Total		320	384	

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

Tick genera	Neck	Udder	Anal	Belly	Legs Perineum	Total
Ambylomma	127	260	58	37	42 131	655
Haylomma	17	11	143	12	10 189	382
Boophilus	125	72	101	266	66 80	710
Rhipicephalus	119	7	92	27	62 253	
Total	388	350	394	342	124 402	2000

From the total of 2, 000 ixodid ticks collected from half body region of 384 cattle four different genera were identified the tick genera identified were *Boophilus* (35.5%) and genera *Ambylomma* (32.8%) *Hyalomma* (19.1%) and *Rhipicephalus* (12.6%) in descending order of abundance (Table 3) by considering relative abundance of each tick genera identified in the study area Boophilus was the most abundant (35.50.63%) while genus *Rhipicephuls* was the least abundant (12.65%).

Preferential Site of Identified Ticks: The observed proportion of tick genera attachment site during this study was summarized and shown in (Table 3) Genus of *Ambylomma* was identified during the study preferred udder / scrotum, neck/genital/anal, legs and belly regions. The *Hyalomma* preferred the attachment site such as brisket, genital /anal, niche/heads, /udder/scrotum and belly and leg region in decreasing order. The genus Rhipicephalus preferred the attachment site such as neck/head, genital/anal, Belly, udder/scrotum, leg and perineum/ brisket. The genus *Boophilus* was encountered mainly in the belly neck/ head, genital/anal, /brisket, udder/scrotum and leg region (Table 3).

Status of Body Condition and Tick Infestation: In cattle, the infestations was higher in medium body conditioned animals (89.1%) and followed by poor cattle's (84 .2 %) and good (78.6%) ones. The observations indicate the medium Conditioned cattle's are least resistive to tick infestation (Table 3).

DISCUSSION

The current study showed the presence of four different genera of ixodid ticks on cattle of the area with the overall prevalence of 83.33% this result was in agreement with the findings of Regassa [14] who reported a prevalence of 82% in Borena province of southern Oromia. In this study genus *Boophilus* was the most abundant tick on cattle in Mokay district (35.5%) this is in agreement with Eyob Eshetu [15] the highest prevalence of *Boophilus* tick genera (35.77%) in and around Gambella town [16] reported that this tick is one of most economically importance tick species in Ethiopia *Boophilus decoloratus* was also identified in Bahir Dar and Humbo district, southern nations, Nationalities and people's region (SNNPR), Ethiopia followed by *R. evertis*

[17, 18] respectively these ticks were also frequently reported by different researchers such as south-western zones of Ethiopia [16, 19, 20]. This was the highest (most abundant) tick identified from the study areas which were similar in many part of east Africa [12].

Amblyomma was found to be the second most abundant (32.75%) tick genes in this study it is a great economic importance because it is an efficient vector of heart water, Nairobi sheep disease and Q. fever [12]. A varigatum was also frequently encountered by different researchers and it is the most abundant tick's species in Bahir Dar [21]. The prevalence of the different ambylomma in all age group was higher compared to the other genera in Werieleke district in Tigray reported by Hagos and Berihun [22].

Hyalomma account 19.1% of the total ticks collected in the study area. This tick species is also commonly found throughout the drier Ethiopia faunal region [12] and it found lower in prevalence than Boophilus and Amblyomma, which were difference from highly abundant in low lands parts of the country were reported as per report by Mesele [21].

Rhipicephalus also comprises 12.6% of the total tick collected which have lower prevalence rate than all other collected tick genera. Commonly found in many areas east of the rift valley and prefers open grass plains in dry bush country. It can transmit the viruses that cause Nairobi sheep disease and theileriosis [12].

The male to female sex ratio was shows that male is greater than female this is due to fully engorged female tick drop off to the ground to lay eggs while male tend to remain permanently attached to the host up several months later to continue feeding and matting with other female on the host before dropping off and hence males normally remains on the host longer than female [2].

In this study the proportion of tick infestation was higher in adult animals (84.7%) as compared to young animals (81.0%). The higher proportion may be due to outdoor management and long distant movement of adult animals to search for food and water compared to younger animals, so the chance of exposure is higher. This finding is also in agreement with the findings of Pawlos and Derese [18], Tamiru Tessema and Abebaw Gashaw [20], Belew, Mekonnen [23] who stated a higher tick burden in adult cattle.

In this study the most infested region of the animal was perineum – brisket (20.1%), genital – anal (19.7%) neck-head (19.4%), udder-scrotum (17.5%) belly (17.1%) and leg (6.2%). Information on predilection sites of ticks is helpful in spraying individual animals since it gives a clue as to which part of the body requires more attention [5].

In this study the infestation rate among to the female animals. This variation may be associated with female animals which were kept properly in the house with good management system for dairy purpose whereas male animals grazing on field all day may be exposed to tick infestation. This result also agreed with the previous work done by other authors [18] in Humbo district in southern Ethiopia and also in line with in Bako, western Ethiopia by Hussen [24]. The proportion of tick infestation was higher in medium body conditioned (89.1%) as compared to poor body conditioned (84.2%) and good body conditioned animals (78.6%) this was due to the fact that medium body scored animals have reduced resistance and are exposed to any kind of disease when grazing on the field and poor body conditioned animals were kept at home due to their inability to walk long distant areas, so they become less infested than medium sized animals but the well fed animals were very resistant to any kind of diseases when they grazed in the field or are kept at home. This result is in agreement with Pawlos and Derese [18].

CONLUSION AND RECOMMENDATIONS

This study determined the prevalence of ixodid ticks on cattle. The important and abundant tick genera revealed in the study area were*, Ambylomma, Haylomma* and *Rhipicephalus Boophilus*. The predilection sites by each genus were greatly variable but the most common site of attachment was found to be preferred udder / scrotum, neck/genital/anal, legs and belly regions. The presence of these tick species might cause severe constraints on cattle. Therefore, there should be awareness creation among animal breeders on tick control and integrated tick control approaches must be initiated in the study area.

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