

Research Article

Prevalence of Ectoparasite Infestations in Cattle in Damot Sore District, Wolaita Zone, Southern Ethiopia

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Abstract

A cross-sectional study was carried out from February, 2024 to July, 2024 with the objectives of determining the prevalence of major ectoparasites of cattle associated with risk factors and to assess the prevalence of ectoparasite infestation in cattle in Damot sore district, Wolaita Zone, Southern Ethiopia. A total of 384 cattle (119 male and 265 female) were used to study the prevalence on live animals. The result obtained from live cattle demonstrates 52.3 % (201/384) of cattle were infested with one (12.4%) and more (39.9%) ectoparasites. Overall, eight genera of ectoparasites which belong to tick (47.7%), lice (4.4%) and mite (0.3%), were identified. Among the genera of the ticks *Amblyomma* (24.7%), *Boophilus* (12.8%), *Hayalomma* and *Rhipicephalus* (1%), respectively. Out of ticks the most prevalent genus was *Amblyomma* with a prevalence of 24.7% followed by genus *Boophilus* with a prevalence of 12.8% and finally genus *Hayalomma* and *Rhipicephalus* with a prevalence of 1.0 %, respectively. Statistically, significant variation ($P < 0.05$) was observed in the prevalence of tick infestation on cattle of different age, sex and herd size groups. Among the genera of lice, the prevalence was mixed lice infestation such as *Haematopinus*, *Linognathus* and *Damalina* (4.4%) were identified. Significant variation ($P < 0.05$) was observed in the prevalence of lice infestation of cattle among the age groups of the study animals. *Demodex bovis* (0.3%) was the only mite species recorded in this study. There was no statistical difference ($P > 0.05$) between the prevalence of mange mite infestation with regard to age, sex and herd size variation. The overall infestation with ectoparasites was high in the females (53.58%) than males (49.57%). The present study revealed that the prevalence of ectoparasites in cattle in the study area and the major ectoparasites identified were tick, lice and mange mite, thus, improved management practice and well-coordinated control interventions are required.

Keywords: Cattl; Ectoparasites; Prevalence; Damote Sore

Abbreviations: CSA: Central Statistical Authority; χ^2 : Chi-Square; D: Desired Level of Precision; DVM: Doctor of Veterinary Medicine; P: Expected Prevalence; KOH: Potassium Hydroxide; N: Required Sample Size; Spp: Species; SPSS: Statistical Package for Social Science; TBDs: Tick Born Diseases

Introduction

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to play great role in the economic development of the country. There are about 38 million cattle, 30 million small ruminants, 1 million camel, 4.5 million equines and 40 million poultry in the country [6]. Cattle provide meat and milk, and contribute to the economic welfare of the people by providing hide power, and traction for agricultural purpose and fertilizer for increasing the productivity of small holdings (Minjauw and McLeod, 2003). In addition, cattle are the major sources of foreign exchange. However, poor health and productivity of animals due to diseases is considered as the major stumbling block to the potential of the cattle industry (Ayele *et al.*, 2003). Parasitism represents a major obstacle to development and utilization of animal resource. In

Ethiopia ectoparasites in ruminant causes serious economic loss to small holder farmers, the tanning industry and the country as a whole through mortality of animals, decreased production, down grading and rejection of skin and hide [13]. The most important constraints to cattle productions are widespread ectoparasitic diseases including dermatophilosis, demodicosis tick and mange mite infestation, respectively [18] and lice infestation have frequently been reported in Ethiopia [4]. Thus, infestations of ectoparasites significantly affect the quality of hide so that affecting directly or indirectly the economy of Ethiopian farmers as well as international market [4]. As a result of their activity ectoparasites may have a variety of direct and indirect effects on their hosts. Ectoparasites; commonly tick, mite and lice are reported to cause a wide range of health problems such as mechanical tissue damage, irritation, inflammation, hypersensitivity, abscesses,

weight loss, lameness, anaemia, and in severe cases death of infested animals with the consequent socioeconomic implications the host species by the inflammation and the infection they inflict on the skin [22], and by their effect on the physiology of the animals as well as through transmission of different diseases such as parasitic, bacterial, rickettsial, and viral diseases to man and animals [26]. The damages inflicted by tick, lice and mites are annoyance, stress, or blood loss. Lice and Tick worry are recognized conditions that reduce feed efficiency and weight gains in livestock [1].

Of the different ectoparasites which affect the skin of animals' ticks are the most prevalent among which Ixodid ticks the most common and harmful blood sucking ectoparasites of cattle worldwide. They are responsible for a wide range of livestock health problems in several countries of the world. They reduce cattle productivity, such as milk yield, skin and hide quality and increase susceptibility to other diseases [15].

Approximately 80% of cattle population of the world are at risk of tick infestation and tick born diseases. In addition to such large volume blood sucking of these ticks, they also inject pathogens such as viruses, bacteria, protozoa and toxins in to their hosts [2]. Skin diseases are one of the major causes of considerable economic loss from defective skin and hide export: 65% of cattle with skin diseases are detected before slaughter and are therefore rejected [9]. However, there is no information on prevalence, identification and risk factors of cattle in Damot Sore district in Wolaita Zone.

Therefore, the present study was carried out with the following objectives:

- To assess prevalence of ectoparasite infestation in cattle in damot sore district in Wolaita Zone.
- To determine the prevalence of some major ectoparasites of cattle and
- To determine the associated risk factors.

Materials and Methods

Description of the Study Area

The study was conducted in Damot sore districts in Wolaita Zone of southern Ethiopia from February, 2024 to July, 2024. The study site is located 390 km south of Addis Ababa and is located at 6°54 N latitude and 37°45E longitude, with an elevation between 1650 and 2980 meters above sea level. The annual rainfall and temperature of the area are 1000–1200 mm and 26–35°C, respectively (National Meteorological Agency, Hawassa branch, 2017). The site is classified under a midaltitude (“Woyinadega” in the local Amharic language) agroecological environment. The dry season lasts from September to February, and the rainy season lasts from March to August. In the study areas, the following table one below shows that the “Different Livestock Populations” was recorded in the Wolaita Zone (CSA, 2013/2014).

Study Population

The study animals were cattle kept under extensive and intensive management system in Damot sore district in Wolaita Zone were used for the study considering different age groups (young, adult and old),

sex groups (male and female), Herd size variations (<14, 14-20 and >20). Age was determined by asking the owner and farm attendant and also by inspecting the dentition. The age of animals was grouped as young (less than 3 years), adult (three to seven years) and old (greater than seven years) according to the classification method used by Bitew *et al.* [5].

Study Design

A cross-sectional study was conducted from February, 2024 to July, 2024 on 384 cattle to identify the major ectoparasites (to genus level) prevailing in the study area and to determine their prevalence.

Sampling and Sample Size Determination

Simple random sampling was subjected on the study population. The total number of cattle required for the study was calculated based on the formula given by Thrusfield [24]. By rule of thumb where there is no documented information about for the prevalence of tick infestation disease in the study area, it is possible to take 50% prevalence. In this study the sample size was calculated using 50% prevalence with 5% desired level of precision and 95% of confidence interval.

$$n = \frac{1.962(p)(1-p)}{d^2}$$

$$n = \frac{1.962(p)(1-p)}{d^2} = 384$$

Where, n= required sample size

p= Expected prevalence (50%)

d= Desired level of precision (5%)

1.96=the value of z at 95% confidence level

Sample Collection and Examinations

The selected cattle were thoroughly investigated by close inspection, parting the hairs against their natural direction for the detection of ectoparasites. Ectoparasites were collected from the different parts of the body of the individual cattle by hand picking. When required, small hairbrush dipped in ethanol was used for the collection of ticks. The point of attachment was smeared with ethanol. Skin scrapings from suspected cases of mange were collected and preserved in 10% formalin. Mites were made to be released from scabs and crusts after addition of 10% KOH on the specimens according to the procedure described by Souls by (1982). Ticks and lice were collected in 70% alcohol. Adequate precautions were taken to preserve the mouthparts and appendages of the ectoparasites during collection. Ectoparasites were preserved in 70% alcohol in clean, well-stopper glass vials which were labeled properly. Identification of the collected ectoparasites was carried out by the aid of stereo microscopy using identification keys set by Wall and Shearer [25].

Data Analysis

The collected data was analyzed by a statistical software namely, SPSS version 16. Prevalence was determined by the formula described by Thrusfield [24] as the rate of number of infested animals and total number of animals in the population. Associations between explanatory variables (age, sex and herd size variation) and prevalence was done by chi-square test. In all analysis, 95% confidence intervals and $P < 0.05$ were set to indicate significance.

Results

Overall Prevalence of Tick Genera

The Overall prevalence of identified genera of ticks was 183 (47.7%). The identified genera include: *Amblyomma* (24.7%), *Boophilus* (12.8%), *Hyalomma* (1.0%) and *Rhipicephalus* (1%) that found on examined cattle. Out of the ticks the most prevalent genus was *Amblyomma* with a prevalence of 24.7% followed by genus *Boophilus* 12.8% and finally genus *Hyalomma* and *Rhipicephalus* with a prevalence of 1% respectively.

Overall Pprevalence of Lice Genera

The Overall prevalence of identified genera of lice was 17(4.4%). The identified genera include: *Damalina* (1.47%), *linognathus* (1.47%) and *Haematopinus* (1.47%) were found on examined cattle.

Overall Prevalence of Mange mite Genera

With regard to genera of mites, *Demodex bovis* was the only mite species identified with a prevalence of 0.3%.

In the above results of different overall genera of ectoparasites belonging to ticks, lice and mange mites were found infesting cattle in the study area. In this study area a total of 384 animals were examined for ectoparasites (Table 2).

Prevalence of Tick Infestation on Cattle of different Age, Sex and Herd Size Variation

The prevalence of ticks in less than three year, three to seven years and greater than seven years on cattle was found 13, 48.27 and 88.89%, respectively. Overall tick prevalence was higher in the greater than seven years age (88.89%) than less than three year and three to seven years age (13% and 48.27%), respectively and there was significance variation(P<0.05) was observed.

Based on their sex variation, it was 41.17% in males and 50.5% in female animals, however the significance difference was observed (P<0.05). Of these the most prevalent ectoparasites were ticks with prevalence of 50.5% in female animals.

Variation in herd size also matters its prevalence rate in that <14 herd sizes were more affected than herd size (14-20) and >20 herd size respectively (Table 3).

Table 1: Livestock population of Wolaita Zone.

Livestock species	Population
Cattle	1,139,154
Sheep	159,550
Goats	213,820
Donkeys	67,838
Poultry	286,425
Total	1,865,783

Table 2: Overall prevalence of Genera of ectoparasites in cattle.

Ectoparasites	Number (n=384)	Percentage (%)
Tick overall	183	47.7%
<i>Amblyomma</i>	95	24.7%
<i>Boophilus</i>	49	12.8%
<i>Hyalomma</i>	4	1.0%
<i>Rhipicephalus</i>	4	1.0%
Mixed tick infestations	31	8.0%
Lice overall	17	4.4%
Mixed lice infestations (L. vitu, H. eury, D.bov.)	17	4.4%
Mange spp	1	0.3%
Overall ectoparasites	201	52.3%

Table 3: Prevalence of tick infestation in cattle.

Factor	Number examined	Number positive	Prevalence (%)	P-value	χ ²
Age					
<3	100	13	13	0	103.385
7-Mar	203	98	48.27		
>7	81	72	88.89		
Total	384	183	150.16		
Sex					
Male	119	49	41.17	0.05	2.902
Female	265	134	50.5		
Total	384	183	91.17		
Herd size					
<14	282	146	51.77	0.025	7.386
14-20	44	17	38.64		
>20	58	20	34.48		
Total	384	183	124.89		

Prevalence of Lice Infestation on Cattle of different Age, Sex and Herd Size Variation

The prevalence of lice in less than three year, three to seven years and greater than seven years on cattle was found 16, 0.5 and 0%, respectively. Mixed lice infestation prevalence was higher in the less than three years age (16%) than three to seven year and greater than seven years age (0.5 and 0%), respectively and there was significance variation (P<0.05) was observed.

Based on their sex variation, it was 8.4% in males and 2.64% in female animals, however no significant difference was observed (P>0.05). Variation in herd sizes also matters its prevalence rate in that <14 herd size was more affected than herd size (14-20) and > 20 herd size respectively, however no significant difference was observed (P>0.05) (Table 4).

Prevalence of Mange Mite Infestation on Cattle of different Age, Sex and Herd Size Variation

The prevalence of mange mite in less than three year, three to seven years and greater than seven years on cattle was found 0, 0.5 and 0%, respectively. Overall mange mite prevalence was higher in the three to seven years age (0.5%) than less than three year and greater than seven years age (0%), respectively and there was no significant variation(P>0.05) was observed.

Based on their sex variation, it was 0% in males and 0.38% in female animals, however no significant difference was observed (P>0.05). Variation in herd sizes also matters its prevalence rate in that >20 herd size was more affected than herd size <14 and (14-20) herd size respectively, however no significant difference was observed (P>0.05) (Table 5).

Table 4: Prevalence of lice infestation in cattle.

Factor	Number examined	Number positive	Prevalence (%)	P-value	χ ²
Age					
<3	100	16	16	0	42.833
7-Mar	203	1	0.5		
>7	81	0	0		
Total	384	17	16.5		
Sex					
Male	119	10	8.4	0.14	6.444
Female	265	7	2.64		
Total	384	17	11.04		
Herd size					
<14	282	14	4.96	0.55	1.195
14-20	44	2	4.6		
>20	58	1	1.73		
Total	384	17	11.29		

Table 5: Prevalence of mange mite infestation in cattle.

Factor	Number examined	Number positive	Prevalence (%)	P-value	χ^2
Age					
<3	100	0	0	0.64	0.894
7-Mar	203	1	0.5		
>7	81	0	0		
Total	384	1	0.5		
Sex					
Male	119	0	0	0.502	0.45
Female	265	1	0.38		
Total	384	0	0.38		
Herd size					
<14	282	0	0	0.06	5.635
14-20	44	0	0		
>20	58	1	1.73		
Total	384	1	1.73		

Discussion

The result of the present study showed a wide range of single and multiple ectoparasites infestation with an overall prevalence of 52.3% in the study area, which was higher than the findings reported by other authors from different regions of Ethiopia: 40.2% (Yacob *et al.*, 2008 a), 15.41% (Yacob *et al.*, 2008 a) and 27.3 % (Onu and Shiferaw, 2013). However, this result was lower than the prevalence, 73.3%, 65.5% and 64.07% reported by (Tadesse *et al.*, 2011) from Ethiopia and [8,14] from Bangladesh, respectively.

During the study period a total of 183 ticks belonging to genera of *Amblyomma* (24.7%), *Boophilus* (12.8%), *Hyalomma* and *Rhipicephalus* (1%), respectively were found on cattle in Ambo Town areas, Ethiopia. Of these, higher proportion of *Amblyomma* (24.7%) and *Boophilus* (12.8%) followed by the lower proportion of *Hyalomma* and *Rhipicephalus* (1%), respectively were observed in cattle. Moreover, three genera of lice, *Haematopinus*, *linognathus* and *Damalina spp* were identified in cattle and also *Demodex* were identified genera of mites in the study area. Similar genera of ticks, lice and mites were identified in different location of the country by different authors [11,23,27,28,31].

In this study, *Amblyomma spp* were found to be the most prevalent ectoparasites in cattle with a prevalence of 24.7%. This finding was in a general agreement with the reports of [28] and (Onu *et al.*, 2013) who reported higher prevalence of tick infestation than other ectoparasites from different regions of the country. Moreover, the higher tick infestation in female cattle of the present study was in line with the report of [14]. In this study statistically there was a significant difference observed in the prevalence of tick infestation between different age groups, herd size variation and sex groups ($P < 0.05$). This finding is in agreement with the previous work of [17,20,30], all of who reported that tick infestation of cattle increases during the wet season of the year, unlike in the dry season.

Lice infestations were the second most important ectoparasites observed on cattle accounting for 4.45% overall prevalence. From the 17 cattle positives for lice, 4.4% were having mixed lice infestation (In this, *Haematopinus spp* were infested 1.5 %, *Linognathus spp* were infested 1.5% and *Damalina spp* were infested 1.5%, respectively).

The overall lice prevalence obtained in this study is higher than observation made in northern Ethiopia, 0.37% by [10] in Tigray region and lower than observations made in southern Ethiopia, 10.4% by (Onu and Shiferaw, 2013) in Benchi maji zone. Such differences in prevalence with the above observations may arise from differences in

agro climate, management and health care of animals'; farmers know how about ectoparasites in the study sites and the sensitivity of the diagnostic method used to reveal ectoparasites.

Of the lice infestations significant difference ($P = 0.000$) among the age groups was observed in this study. Higher prevalence was recorded in animals with the age less than 3 years (16%), followed by animals with the age of 3-7 years (0.5%) and the least was registered in animals greater than 7 years (0%). This has a strong agreement with the previous work of [10,16], who reported that there were statistically significant differences in the prevalence of lice infestation among age groups. But this study was in contrary with the study of [3] in wolmera district of Oromia Region in which no statistically significance difference ($P > 0.05$) was observed in the prevalence of lice infestation between sex and herd size variations of the animal. This difference could be attributed to the management condition where most animals are kept together providing greater chance of direct contact which contributed for transmission and maintenance of external parasites.

Moreover, the overall prevalence of mite on cattle was 0.3% and genus *Demodex bovis* was the only genus of mange mites that was identified in cattle in the study area. The current finding on prevalence of *Demodex bovis* was in agreement with the reports of [21,27,28] (Onu and Shiferaw, 2013) who reported 0.4, 0.9 and 0.68% prevalence of demodex bovis on cattle respectively. The low prevalence of mite infestation in this study could be due to the fact that the length of time mites can survive off its host is strongly affected by ambient temperature and humidity. This has important implication for the potential for the transmission from the environment to the host, transmission being greater considerably in the winter [26]. There was no significant dispersion in the infestation of animals by mites with regard to sex, age and herd size variation in cattle.

Conclusion and Recommendations

This study was conducted to identify the major ectoparasites and their prevalence on the cattle ruminants. The most important ectoparasites identified were tick, lice, and mange mite. Ticks were the most abundant ectoparasites in the study area followed by Lice and Mange mite. The infestations of ectoparasites are important affecting the health and productivity of cattle ruminants in Damot sore district in Wolaita Zone. Lack of awareness about the significance of the problems among owners for control schemes have contributed to the wide spread nature of ectoparasites in the area. In view of the significance of skin and hide production as main source of foreign currency to the country and the ever-increasing demands of livestock market, the high prevalence of ectoparasites prevailing in cattle in the area require serious attention to minimize the effect of the problem.

Based on the above conclusion the following recommendations are forwarded:

- Strategic treatment of cattle ruminants with insecticides should be practiced in the study area to minimize the impact of ectoparasites on the health of animals.
- Awareness creation for the local farmers about the control of ectoparasites is essential.
- Newly introduced animals should be treated before they are introduced in the herd or in to the farm.

- Better cattle ruminant management practices should be implemented to minimize transmission of the disease and increase the productivity of cattle ruminants.

- Further detail study should be done to assess the seasonal dynamicity and major ectoparasite borne disease in the study area.

Author Statements

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