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Full Length Research Paper

Population dynamics of cattle ectoparasites in Western Amhara National Regional State, Ethiopia

Nigatu Kebede[1]* and Teshome Fetene[2]

[1]Aklilu Lemma Institute of Pathobiology, Addis Ababa University, Ethiopia.

[2]Adamitulu PPSC, Research and Development Department, Addis Ababa, Ethiopia.

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Skin diseases are one of the major causes of considerable economic loss from defective skin and hide export. Skin diseases caused by lice, ticks and mange mites, are among the major diseases of cattle causing serious economic loss to the farmer, the tanning industry and the country as a whole. The study was carried out from November 2009 to June 2010 to determine ectoparasites infestations and diversity in Awi zone, Amhara region. A total of 783 cattle of different breeds, husbandry and sex were inspected for ectoparasites identification, and ticks (89.4%), lice (63.5%) and mange (95.5%) were collected from examined animals. Tick species identified were: *Amblyomma* variegatum (49.2%), *Boophilus decoloratus*, (21.2%), *Hyalomma marginatum* (9.8%), *Hyalomma truncatum* (6.2%), *Rhipicephalus evertsi evertsi* (6.6%), and *Rhipicephalus pulchellus* (5.3%). Similarly, *Linognathus vituli* (76.3%) and *Damalina bovis* (23.7%) were lice species identified. Furthermore, mange mites identified were *Demodex bovis* (95.9%) and *Chrioptes bovis* (4.2%). Seasonal infestation of ticks, lice and mange was higher in local cattle breed and extensive husbandry than cross and intensive one. The largest number of ticks, lice and mange collected from a single animal was 25, 13 and 5, respectively. The prevailing ectoparasites mainly in different cattle breeds reared in Awi zone requires attention in order to minimize the spread of infestation which cause skin and hide quality degradation and disease transmission.

Key words: Ticks, lice, mange, infestation, Awi zone, Ethiopia.

INTRODUCTION

Livestock perform multiple functions in the Ethiopian economy by providing food, input for crop production and soil fertility management, raw material for industry, cash income as well as in promoting saving, fuel, social functions, and employment. Various estimates showed that the livestock sub-sector contributes 12 to 16% of the total and 30 to 35% of agricultural GDP, respectively (MEDaC, 1998; AAPBMDA, 1999).

Ethiopia has the largest livestock population in the continent. There are approximately 41.3 million cattle, 46.9 million small ruminants, more than 1 million camels and 4.5 million equines, and 40 million chickens (CSA, 2004). Despite the large number of livestock, there has been a decline in national and per capita production of livestock and livestock products, export earnings from livestock, and per capita consumption of food from livestock origin since 1974, in comparison to other African countries (Workalemahu, 2000).

The livestock sub-sector is the second major source of foreign currency through export of live animals and hides and skins (MEDaC, 1998; FAO, 1999). Even though ruminants are important components of the Ethiopian farming system, their contribution to food production, rural income and export income are far below the expected potential. This is because cattle production in Ethiopia is constrained by the compound effects of diseases, poor feeding and poor managements

*Corresponding author. E-mail: nigatukebede@yahoo.com. Tel. +251 112763091.

(Getachew, 1995).

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 (Kassa et al., 1998; Wondwossen, 2000). Skin diseases caused by lice, ticks and mange mites, are among the major diseases of cattle causing serious economic loss to the farmer, the tanning industry and the country as a whole. Skin diseases cause mortality, decreased production and reproduction, and downgrading and rejection of skins. Bekele (2002) estimated an annual loss of US$500 000 from hide and skin downgrading from ticks, and approximately 65.5% of major defects of hides in eastern Ethiopia are from ticks. Major cattle tick-borne diseases in Ethiopia are anaplasmosis, babesiosis, theileriosis (Mekonnen et al., 1992; Mekonnen, 1996) and streptothricosis (Mekonnen, 1996). However, the status of cattle ectoparasites in Awi zone, northwestern Amhara region is not known. Therefore, the present study was conducted to identify and determine the prevalence of ectoparasites of cattle and to assess the relationship of ectoparasites with production system, breed, and sex of the animals.

MATERIALS AND METHODS

Study area

The present study was conducted from November 2009 to June 2010 in Awi zone, Amhara National Regional State. Awi zone is located in the western part of Amhara region characterized by three agro ecology (low, middle and high altitude); here, animal husbandry is mainly extensive cross and few local zebu breed dairy cows are kept in intensive production system in the town. It is subdivided in to seven districts.

Awi zone has 950,000 cattle, 360,000 sheep, 220,000 goats, 91,000 equine, 81,000 poultry and 68,000 bee colonies (CSA, 2004). Samples were collected from three districts, Dangila, Banja Shikudad and Guangua, and laboratory study was conducted at Chagni veterinary clinic and the Aklilu Lemma Institute of Pathobiology of the Addis Ababa University. The climate of the study area is characterized by short rainy season (February/March) and long rainy season (June to September) and extended dry season from October to February. It lies at an altitude range of 1800 to 2300 m above sea level. The average annual rainfall is 1750 mm, while the average monthly air temperature ranges from 17 to 27°C.

Study animals and study design

A total of 783 cattle of different breed, husbandry and sex were inspected for the presence of ticks, lice and mange mites. Ectoparasites were collected from cattle presented to districts veterinary clinics and animals owned by small scale dairy farmers in the town. Top line (mid-dorsal surface), midway (between the withers and the pelvis), and withers, around each eye, right and left cheek, muzzle, sternum, dewlap, udder, neck and under tail and feet of the animals were examined for tick collection. Similarly, all body part surface of examined animals was inspected to look for adult lice glued on the skin. Deep skin scrapings from the margin of the lesion on the animals with clinical signs of mange were collected in universal bottles having 10% formalin. Lice and ticks were picked with forceps and placed in screwed bottle containing 68% methanol and then labeled for sex, breed, date of collection, areas of origin and type of animal husbandry. Animals which were found positive for at least one parasite was considered positive for ectoparasites' infestation.

Identification of ticks into genera and species was conducted using taxonomic criteria (Hoogestraal, 1956; Walker et al., 2003). Lice were identified using the method described by Soulsby (1982). 10% KOH was added to the skin scrapping suspected for mange preserved in 10% formalin so that mites may be released from scabs and crusts. The identification of the mange mite species was done based on their morphological characteristics (Soulsby, 1982; Urquhart et al., 1967). Accordingly, the data obtained was recorded. Ectoparasites index was determined for each animal by counting live ticks, lice and mange mites within specific body regions of the animal.

Data analysis

The data was analyzed using SPSS v.15. Chi-square test was applied to determine the association of factors at $P \leq 0.05$. Moreover, percentage had been used to calculate proportion of animals infested with ectoparasites and number of parasites counted.

RESULTS

Ectoparasites identified

The ectoparasites identified were ticks 89.4% (700/783), lice 63.5 % (497/783) and mange 95.5% (748/783). Animals were found to be more infested with ectoparasites during April to May (Figure 1).

A total of 2950 adult ticks grouped into four genera and six species were collected. *Amblyomma variegatum* (49.2%), *Boophilus decoloratus*, (21.2%), *Hyalomma marginatum* (9.8%), *H. truncatum* (6.2%), *Rhipicephalus evertsi evertsi* (6.6%), and *Rhipicephalus pulchellus* (5.3%) were proportion of tick species collected. *Ambylomma*, and *Hyalomma* tick species were common on udder and dewlap body parts of the animals but *Rhipicephalus* spp. were collected from tail areas of the animals' body. Similarly, *Boophilus* were collected from neck and shoulder regions of the animal body.

A total of 1921 adult lice comprising *Linognathus vituli* (76.3%) and *Damalina bovis* (23.7%) were collected from the study areas. Lice population was high in the spring.

Demodex bovis and *Chorioptes bovis* were mange mite species identified in the area infesting cattle. 932 mange mites parasite were collected of which 95.9 and 4.2% was species composition of *D. bovis* and *C. bovis,* respectively.

Seasonal infestation of ectoparasites on cattle of different breed, sex and husbandry

The study showed that tick infestation in local breeds

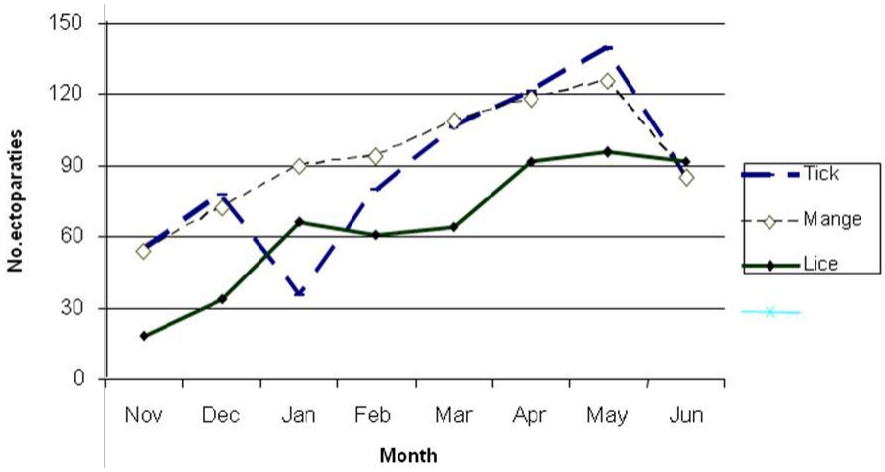

Figure 1. Monthly population dynamics of ticks, lice and mange mites in cattle.

Table 1. Proportion of seasonal ticks' infestation on cattle in different sex, breed and husbandry.

Season	Number of animals		Breed		Sex		Husbandry	
	Examined	Positive (%)	Local Zebu (%)	Cross (%)	Male (%)	Female (%)	Intensive (%)	Extensive (%)
Autumn	55	50 (90.9)	40 (72.7)	10 (18.2)	20 (36.4)	30 (54.6)	18 (32.7)	32 (58.2)
Winter	267	198 (74.2)	161 (60.3)	37 (13.9)	89 (33.3)	109 (40.8)	40 (15)	158 (59.3)
Spring	369	366 (99.2)	352 (95.4)	14 (3.8)	203 (55.0)	163 (44.2)	106 (28.7)	260 (70.5)
Summer	92	86 (93.5)	75 (81.5)	11 (12)	45 (48.9)	41 (44.6)	29 (31.5)	57 (62.0)
Total	783	700 (89.4)	628	72	357	343	193	507

Table 2. Seasonal lice infestation on cattle breeds, sex and husbandry bases.

Season	Number of animals		Breed		Sex		Husbandry	
	Examined	Positive (%)	Local Zebu (%)	Cross (%)	Male (%)	Female (%)	Intensive (%)	Extensive (%)
Autumn	55	21 (38.2)	11 (20)	10 (18.2)	6 (10.9)	15 (27.3)	10 (18.2)	11 (20)
Winter	267	161 (60.3)	112 (42)	49 (18.4)	73 (27.3)	88 (33)	43 (16.1)	118 (44.2)
Spring	369	242 (65.6)	233 (63.1)	9 (2.4)	148 (40.1)	94 (25.5)	67 (18.2)	175 (47.4)
Summer	92	73 (79.4)	62 (67.4)	11 (52.5)	48 (52.2)	25 (27.2)	3 (3.3)	70 (76.1)
Total	783	497 (63.5)	418	79	275	222	123	374

(94.4%) was significantly ($P < 0.001$) higher than in cross breeds (61.1%) of cattle. Similarly, tick infestation was significantly ($P < 0.05$) higher in cattle kept under an extensive husbandry (72.5%) than in cattle kept under an intensive system (27.5%) (Table 1). *Boophilus* spp. of ticks was very common in intensive husbandry than other species. 25 ticks were the largest number collected from positive animals.

Overall lice infestation was 62.9 and 67 % in local and cross breeds of cattle, respectively which is not significantly different ($P > 0.05$). Similar to ticks, lice infestation was significantly higher ($P < 0.05$) in animals under extensive production system (75.2%) than in cattle under intensive system (24.8%) (Table 2). 13 adult lice were collected from a single examined animal.

The study revealed that the seasonal infestation of both *Demodex and Chorioptes* was 83.7 and 11.8% in local and cross breeds of cattle, respectively. With similar fashion, seasonal infestation of 77.3 and 22.7% intensive and extensive production systems, respectively was confirmed for mange mites (Table 3). Mange mite infestation was highly significant ($P < 0.001$) in local cattle

Table 3. Seasonal mange mites infestation on cattle breed, sex and husbandry bases.

Season	Number of animals		Breed		Sex		Husbandry	
	Examined	Positive (%)	Local Zebu (%)	Cross (%)	Male (%)	Female (%)	Intensive (%)	Extensive (%)
Autumn	55	44 (80)	35 (63.6)	9 (16.4)	14 (25.5)	30 (54.5)	12 (21.8)	32 (58.2)
Winter	267	266 (99.6)	216 (80.9)	50 (18.7)	121 (45.3)	145 (54.3)	66 (24.7)	200 (74.9)
Spring	369	353 (95.7)	340 (92.1)	13 (3.5)	202 (57.7)	151 (40.9)	83 (22.5)	270 (73.2)
Summer	92	85 (92.4)	64 (69.6)	21 (22.8)	50 (54.3)	35 (38.0)	9 (9.75)	76 (82.6)
Total	783	748 (95.5)	665	93	387	361	170	578

breed and extensive animal husbandry (Table 3). Five mange parasites were found infesting individual animal.

DISCUSSION

The results of the present study showed that high infestation of tick, mange and lice is found on local zebu and cross cattle breeds kept under different production systems. This suggests that the study area is conducive for survival and development of different stages of ectoparasites of cattle.

The variation in ectoparasites infestation on cattle of different breeds and production systems might be attributed to differences in animal husbandry and control measures against ectoparasites on local cattle breeds, which are usually kept under an extensive production system unlike cross breeds. The poor husbandry practices of small holder dairy farmers may be a determinant making the animals more prone to tick infestation (Sajid et al., 2008).

In the present study, tick infestation was higher than other ectoparasites and the finding argues with previous studies of Kakar and Kakarsulemankhel (2008). The probable reason would be long period of humid climatic condition in the study area. The climatic determinants of the study areas are very important in the prevalence of ticks in domestic animals Humidity and prolonged sunlight favor the survival and reproduction of ticks (Sajid et al., 2008). Zenenbe (2005) and Shiferaw and Abebe (2006) reported that tick infestation of cattle increased during the wet season of the year, unlike in the dry seasons.

Ticks identified in the study area were *Ambylomma, Boophilus* and *Hyalomma* and *Rhipicephalus* spp. Yacob et al. (2008) identified *Ambylomma, Boophilus* and *Hyalomma* tick genera in central Ethiopia.

A. variegatum was predominant tick species followed by *B. decoloratus* and *H. marginatum*. This is not in agreement with Berkvens et al. (1998), Mekonnen et al. (2001), Gebre et al. (2003), Tomassone et al. (2004), Shiferaw and Abebe (2006) and Solomon et al. (2007), who reported the predominance of *B. decoloratus*. Similarly, Castella et al. (2001), Bekele (2002), Tomassone et al. (2004), Zenenbe (2005), Abreha et al. (2007) and Bazarusanga et al. (2007) reported the predominance of *Rhipicephalus* spp. infestation of cattle. On the contrary, Ica et al. (2007), Omer et al. (2007), Szabo et al. (2007), Yamane et al. (2006), and Sajid et al. 2008, reported the predominance of *Hyalomma* spp., *Amblomma* spp. and *Haemaphysalis* spp., respectively. This variation between the current and previous studies can most probably be attributed to differences in agro-ecology of study sites, management and breed of the study cattle (Szabo et al., 2007).

In our study, *Rhipicephalus* spp. were the least dominant tick species of cattle. This observation is in agreement with the previous findings (Gebre et al., 2003; Shiferaw and Abebe, 2006; Solomon et al., 2007) in different parts of Ethiopia. This observation supports the fact that the genus *Rhipicephalus* occupies a wide range of climatic and ecological zones in different habitats throughout Ethiopia.

The major lice species in the study area were *Linognathus vitulii* and *D. bovis.* The findings is similar to those of other scholars (Colwel et al., 2001; Nafstad and Grønstøl, 2001; Kumsa and Bekele, 2008), both the biting and sucking lice were identified from animals in different husbandry system. Lice infestation was higher in the extensive production system than in the intensive production system. This may be because poor management and veterinary services in the extensive system that favors transmission of lice infestation. Similarly, lice infestation was greater in winter and spring similar to the finding of Colwel et al. (2001).

D. bovis and *C. bovis* were proved to cause mange mite infestation in cattle in the study areas suggesting that cattle are infested with both species of mange mites. The difference in infestation rates of mange in local and cross breeds of cattle, and intensive and extensive husbandry would be the difference in management and sanitation that allows that strict control measure is in place.

Considering the importance of skin and hides as a main source of foreign currency to the country, the prevailing ectoparasites mainly in different cattle breeds reared in Awi zone requires attention in order to minimize the spread of infestation and increase income earnings of

farmers and small scale holders whose livelihood is dependent on their animals.

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