

Full Length Research Paper

Hard Ticks of Camel in Southern Zone of Tigray, Northern Ethiopia

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This cross-sectional study was carried out in Raya Azebo district with the objective of determining the prevalence and species diversity of hard ticks encountered in camels. During the study period, a total of 384 camels were examined and 96.6% of them were found infested with ticks. A total of 15,723 ticks were collected from half body regions of infected camels during the study period. The average tick burden from half body region of camels was 42.4 ± 19.63 . In this study four genera and ten species of hard ticks were identified. The genera identified were *Amblyomma* (11.11%), *Boophilus* (1.8%), *Hyalomma* (23.32%) and *Rhipicephalus* (61.77%). The tick species identified during the study period were *Amblyomma variegatum*, *Boophilus decoloratus*, *Amblyomma cohaerence*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus pulchelis*, *Amblyomma gemma*, *Amblyomma lepidum*, *Hyalomma rufipes*, *Hyalomma dromedarii* and *Hyalomma truncatum* at a prevalence of 22.9, 16.7, 23.2, 41.5, 92.7, 7.8, 3.4, 47.4, 42.7 and 8.9%, respectively. Further study and appropriate control measures are recommended to improve the health and productivity of camel.

Key words: *Amblyomma*, *Boophilus*, camel, ectoparasite, *Hyalomma*, Raya Azebo, *Rhipicephalus*, tick.

INTRODUCTION

The camel plays an important role in the culture and agriculture of many countries. It is an important working animal of the arid and semi-arid ecosystem because of its unique adaptive physiological characteristics (Rabana et al., 2011). However, camel production is conversely affected by the occurrence of various diseases, inadequate veterinary services and feed shortage (Bekele, 2010). Of all, various internal and external parasitic diseases have been reported to be the major problems

affecting the health, productivity and performance of camels. Ticks are one of the most important parasites among the factors affecting the health, productivity and performance camels (Anwar and Khan, 1998; Parsani et al., 2008; Bekele, 2010); by transmitting various diseases causing agents, and causing blood loss, irritation, inflammation, hypersensitivity and damage to hide and udder (Wall and Shearer, 2001; Walker et al., 2003). In Ethiopia, ticks are common in all agro-ecological zones of

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the country (Pegram et al., 1981). The most important tick species reported to infest camel in Ethiopia include *Hyalomma* species, *Amblyomma* species, *Boophilus* species and *Rhipicephalus* species (Richard, 1979; Melaku and Fisseha, 2001; Lawal et al., 2007; Parsani et al., 2008; Dinka et al., 2010).

Knowing the prevalence and geographical distribution of tick species is important for the control of tick and tick born diseases. Studies conducted in Ethiopia are limited to the Eastern part of the country (Zelalem, 1994; Abebe, 2001; Melaku and Fisseha, 2001; Woldemeskel, 2001; Dinka et al., 2010) and there is limited information in other part of the country. Therefore, this study was conducted to estimate the prevalence and species diversity of ticks in camels in Raya-Azebo district, northern part of Ethiopia.

MATERIALS AND METHODS

Study area

The study was conducted in Raya Azebo district, Southern Zone of Tigray Region. Raya Azebo is located at latitude of 12° to 18° North and longitude of 38° to 39°. The average elevation of the district is 1470 to 2370 m above sea level. The mean annual rain fall is 610.5 (351 to 870) mm. The mean minimum and maximum annual temperature for the area are 15 and 30°C, respectively (RAWAO, 2010).

Study type, study animals and sample size determination

A cross-sectional study was undertaken to estimate the prevalence and to identify the species composition of tick in camel. The sample size was determined following the formula described by Thrusfield (1995). By considering the expected prevalence of 50 and 5% absolute precision with 95% confidence level, the sample size was calculated as follows:

$$n = \frac{1.96^2 \times P_{exp} (1 - P_{exp})}{d^2}$$

Where, n = required sample size, P_{exp} = expected prevalence (50%), d= desired absolute precision (5%), 1.96 = Z-value for the 95% confidence interval. Based on this formula the minimum sample size for the present study was 384 camels. The study camels were selected by simple random sampling method.

Sample collection and identification of tick

First, general physical examination was conducted on each camel. All data regarding the age, sex, body condition and other related information of the animals were recorded appropriately. The age and body condition of camels were determined based on their dentition and hump structure as described previously (Schwartz and Dioli, 1992; CACIA, 1995). After proper restraining, all visible adult ticks were collected from half-body regions of camels (on right

side of the study animal) by hand and using good quality steel forceps. The collected adult ticks were kept in a properly labeled plastic containers containing 70% ethanol for further identification. The collected ticks were identified to their species level at Raya Azebo veterinary clinic and parasitology laboratory of college of Veterinary Medicine in Mekelle University, using stereomicroscope. Sampling and identification of ticks were carried out according to the standard technique recommended by Hoogstraal (1956), Okello-Onen et al. (1999) and Walker et al. (2003).

Data analysis

The data was entered into Microsoft excel spread sheet and coded appropriately. For data analysis, SPSS version 17 was used. In this data analysis, descriptive statistics was used to determine the prevalence of tick infestation in camels. The chi-square test was used to determine the existence of any association between tick distribution and the risk factors like age, body condition score and sex. In all cases, 95% confidence intervals and $p < 0.05$ were set for significance.

RESULTS

Out of the 384 camels examined, 371 (96.6%) of them were found infested with tick. A total of 15,723 hard ticks were collected from half body regions of all infested camels during the study period. The average tick burden from half body region of camels was 42.4 ± 19.63 (range 23 to 62). In general, four genera and ten species of hard ticks were identified. The genera identified were *Rhipicephalus* (61.77%), *Hyalomma* (23.32%), *Amblyomma* (11.11%) and *Boophilus* (1.8%). The tick species identified during the study period were *Rhipicephalus pulchelis*, *Hyalomma rufipes*, *Hyalomma dromedarii*, *Rhipicephalus evertsi evertsi*, *Amblyomma cohaerence*, *Amblyomma variegatum*, *Boophilus decoloratus*, *Hyalomma truncatum*, *Amblyomma gemma* and *Amblyomma lepidum* at prevalence of 92.7, 47.4, 42.7, 41.5, 23.2, 22.9, 16.7, 8.9, 7.8 and 3.4%, respectively (Table 1). *R. pulchelis* was the predominate tick species identified in our study; with a proportion of 53.7%. The proportion of each tick species identified is indicated in Table 2.

Except for *A. variegatum* the age of animal had no effect ($p > 0.05$) on the prevalence of tick species. *B. decoloratus*, *A. cohaerence*, *A. gemma*, *H. dromedarii* and *R. pulchelis* infestation had showed statistically significant variation ($p < 0.05$) between male and female camels. In addition, the body condition of camel had no effect ($p > 0.05$) on the prevalence of tick species except for *H. truncatum* (Table 3).

DISCUSSION

The present study assesses the prevalence and species of hard tick infestation encountered on camel in northern

Table 1. The prevalence of tick species of camels in Raya Azebo district.

Tick species	No. of camels infested	Prevalence (%)
<i>Rhipicephalus pulchelis</i>	356	92.7
<i>Hyalomma rufipes</i>	182	47.4
<i>Hyalomma dromedarii</i>	164	42.7
<i>Rhipicephalus evertsi-evertsi</i>	159	41.5
<i>Amblyomma cohaerence</i>	89	23.2
<i>Amblyomma variegatum</i>	88	22.9
<i>Boophilus decoloratus</i>	64	16.7
<i>Hyalomma truncatum</i>	34	8.9
<i>Amblyomma gemma</i>	30	7.8
<i>Amblyomma lepidum</i>	13	3.4

Table 2. The proportion of tick species in Raya Azebo district.

Tick species	No. of ticks collected	Proportion (%)
<i>Rhipicephalus pulchelis</i>	8443	53.7
<i>Hyalomma dromedarii</i>	2011	12.8
<i>Hyalomma rufipes</i>	1756	11.2
<i>Rhipicephalus evertsi-evertsi</i>	1269	8.1
<i>Amblyomma cohaerence</i>	1102	7.0
<i>Amblyomma variegatum</i>	376	2.4
<i>Boophilus decoloratus</i>	283	1.8
<i>Hyalomma truncatum</i>	214	1.4
<i>Amblyomma gemma</i>	176	1.1
<i>Amblyomma lepidum</i>	93	0.6
Total	15723	100

part of Ethiopia. Out of the 384 camels examined, 371 (96.6%) were found infested with tick. This result was higher than Dinka et al. (2010) who reported a prevalence of 61.46% tick infestation on camel in eastern Ethiopia. Similarly, the finding of Lawal et al. (2007) revealed that 92.7% of the total camel in Nigeria was infested by ectoparasites. The average tick burden from half body region of camels in this study was 42.4 ± 19.63 . This was in accordance with the previous investigators who reported high tick load per camel (Zelege and Bekele, 2004; Bekele, 2010; Nazifi et al., 2011). These results showed that tick infestations in camel are highly prevalent.

R. pulchelis was the most abundant tick species found on 92.7% of the examined camels and constituted 53.7% of the total ticks collected. Zelalem (1994), Abebe (2001), Zelege and Bekele (2004) and Dinka et al. (2010) also reported this tick species from camel with a prevalence of 52.63, 70.47, 85.2 and 27.86%, respectively. The high prevalence of this tick in this study might be due to the

fact that *R. pulchellus* is a tick of savanna, steppe and desert climatic regions. It is also among the commonest tick species present in North East Africa and the Rift Valley areas (Walker et al., 2003). *H. rufipes* was the second ranked tick species on camel with a prevalence of 47.4% and constituted 11.2% of the total ticks collected. This result was lower than the finding of Lawal et al. (2007) who reported a prevalence of 22.9% in Nigeria. *H. rufipes* is widely distributed in the most arid parts of tropical Africa, receiving 250 to 650 mm annual rainfall (Hoogstraal, 1956). In addition, *Rhipicephalus evertsi evertsi* was also identified at a prevalence of 41.5%. *R. evertsi evertsi* constituted 8.1% of the total ticks collected. This tick species shows no apparent preference for particular altitude, rainfall zones and seasons (Pegram et al., 1981).

The prevalence of *H. dromedarii* in this study was 42.7% and constituted 12.8% of the total ticks collected. This result was in agreement with the result of Lawal et al. (2007) who reported a prevalence of 46.9% but higher

Table 3. The distribution of tick species among/between the different sexes, ages and body condition score of camels.

Risk factor	Category level	No. of animal infested (%)									
		Tick species									
		AV	BD	AC	HMF	REE	AL	HT	AG	HD	RP
Age (year)	1-4	20 (5.2)	15 (3.9)	19 (4.9)	32 (8.3)	26 (6.8)	2 (0.5)	5 (1.3)	5 (1.3)	3 (0.8)	67 (17.4)
	4-8	14 (3.6)	11 (2.9)	63 (16.4)	36 (9.4)	35 (9.1)	1 (0.3)	9 (2.3)	3 (0.8)	28 (7.3)	75 (19.5)
	8-12	27 (7.0)	15 (3.9)	15 (3.9)	43 (11.2)	30 (7.8)	3 (0.8)	7 (1.8)	8 (2.1)	33 (8.6)	81 (21.1)
	12-16	9 (2.3)	14 (3.6)	17 (4.4)	38 (9.9)	39 (10.2)	1 (0.3)	9 (2.3)	7 (1.8)	38 (9.9)	67 (17.4)
	≥16	18 (4.7)	9 (2.3)	21 (5.5)	33 (8.6)	29 (7.6)	6 (1.6)	4 (1.0)	1 (1.8)	33 (8.6)	66 (17.2)
	P-value	0.019	0.583	0.470	0.916	0.275	0.117	0.602	0.608	0.335	0.308
Sex	Female	19 (4.9)	6 (1.6)	15 (3.9)	43 (11.2)	31 (8.1)	3 (0.8)	13 (3.4)	17 (4.4)	56 (14.6)	94 (24.5)
	Male	69 (18.0)	58 (15.1)	74 (19.3)	139 (36.2)	128 (80.5)	10 (2.6)	21 (5.5)	13 (3.4)	108 (28.1)	262 (68.2)
	P-value	0.436	0.002	0.049	0.631	0.053	0.888	0.056	0.000	0.000	0.007
BCS	Thin	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)	1 (0.3)	0 (0.0)	1 (0.3)	0 (0.0)	1 (0.3)	1 (0.3)
	Moderate	53 (13.8)	32 (8.3)	53 (13.8)	103 (28.8)	93 (24.3)	10 (2.6)	24 (6.2)	22 (5.7)	110 (28.6)	217 (56.3)
	Good	35 (9.1)	32 (8.3)	36 (9.4)	78 (20.3)	65 (17.9)	3 (0.8)	9 (2.3)	8 (2.1)	53 (13.8)	138 (35.9)
	P-value	0.846	0.123	0.811	0.161	0.381	0.483	0.002	0.343	0.045	0.960

(AV) *Amblyomma variegatum*, (BD) *Boophilus decoloratus*, (AC) *Amblyomma cohaerence*, (REE) *Rhipicephalus evertsi evertsi*, (RP) *Rhipicephalus pulchelis*, (AG) *Amblyomma gemma*, (AL) *Amblyomma lepidum*, (HMR) *Hyalomma rufipes*, (HD) *Hyalomma dromedarii*, (HT) *Hyalomma truncatum* and (BCS) body condition score.

higher than the findings of Abebe (2001) and Dinka et al. (2010) studies who reported a prevalence of 20.44 and 15.36%, respectively. Because of its adaptation to extreme dryness and camel hosts, *H. dromedarii* is commonly found in desert climates and in areas where camels are present (Hoogstraal, 1956; Walker et al., 2003).

In this study, the prevalence of *Amblyomma variegatum* was 22.9% and constituted 2.4% of the total ticks collected. Zeleke and Bekele (2004) reported *A. variegatum* from camel at a prevalence of 1.8%. This tick species was also reported by Banaja and Ghandour (1994) and Lawal et al. (2007) in camel from Saudi Arabia

and Nigeria, respectively. *Amblyomma gemma* was also found at a prevalence of 22.9% in this study. This result was higher than the finding of Zeleke and Bekele (2004) and Dinka et al. (2010) who reported a prevalence of 4.0 and 15.10% in camels, respectively. Additionally, *Amblyomma cohaerence* and *Boophilus decoloratus* were encountered on 23.2 and 16.7% of the examined camels, respectively. *A. variegatum*, *A. gemma*, *A. cohaerence* and *B. decoloratus* were identified from different domestic animals and from different parts of Ethiopia. These tick species are common and widely distributed on livestock in Africa within a wide variety of climates (Morel, 1980; Pegram

and Higgins, 1992; Okello-Onen et al., 1999; Walker et al., 2003). Even though their proportions were very low, *Hyalomma truncatum* and *A. lepidum* were also detected at a prevalence of 8.9 and 3.4%, respectively. Both *H. truncatum* and *A. lepidum* are adapted to dry habitats and occur in arid and semi-arid areas (Walker et al., 2003).

In general, this and other studies showed that ticks are still among the most commonly found ectoparasites of camels worldwide. Further studies should be undertaken in order to understand the distribution pattern of ticks, to estimate the impact of tick infestation on camel

production, and to design effective control and prevention strategies.

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REFERENCES

- Abebe F (2001). Prevalence and intensity of ectoparasites infestation in ISSA camels, Eastern Ethiopia. DVM thesis, FVM, AAU, Debre Zeit.
- Anwar AH, Khan MN (1998). Parasitic Fauna of Camel in Pakistan. *Proceedings of the Third Annual Meeting for Animal Production Under Arid Conditions* 2:69-76.
- Banaja AA, Ghandour AM (1994). A review of parasites of camel (*Camelus dromedarius*) in Saudi Arabia. *J. King Abdulaziz Univ. Sci.* 6:75-86
- Bekele M (2010). An Epidemiological Study on Major Camel Diseases in the Borana Lowland, Southern Ethiopia." DCG Report No. 58, Drylands Coordination Group,Oslo. pp.67-98.
- CACIA (1995). Central Australian Camel Industry Association Inc. Available at:<http://www.camelsaust.com.au/liveage.htm>. Accessed on June 10, 2014.
- Dinka A, Aeyersusalem B, Yacob HT (2010). A study on major ectoparasites of camel in and around Dire Dawa, Eastern Ethiopia. *Rev. Méd. Vét.* 161(11):498-501.
- Hoogstraal H (1956). African Ixodoidea. Vol. I. Ticks of the Sudan (with special reference to Equatoria Province and with Preliminary Reviews of the Genera Boophilus, Margaropus, and Hyalomma). African Ixodoidea. Vol. I. Ticks of the Sudan (with special reference to Equatoria Province and with Preliminary Reviews of the Genera Boophilus, Margaropus, and Hyalomma). pp. 200-1101.
- Lawal MD, Ameh IG, Ahmed A (2007). Some ectoparasites of *Camelus dromedarius* in Sokoto, Nigeria. *J. Entomol.* 4:143-148.
- Melaku T, Feseha G (2001). A study on the productivity and diseases of camels in eastern Ethiopia. *Trop. Anim. Hlth. Prod.* 33:265-274.
- Morel P (1980). Study on Ethiopia Ticks (Acarida, Ixodoidea). Republic of France, Minister of Foreign affairs, Feench Veterinary Mission, Addis Ababa, C.J.E.M.V.T. pp.7-332.
- Nazifi S, Tamadon A, Behzadi MA, Haddadi S, Raayat-Jahromi AR (2011). One-Humped Camels (*Camelus dromedarius*) Hard Ticks Infestation in Qeshm Island, Iran. *Vet. Res. Forum* 2:135-138.
- Okello-Onen JM, Hassan, SM, Essuman S (1999). Taxonomy of African Ticks, an Identification Manual. International Center for Insect Physiology and Ecology press, Nairobi, Kenya. Pp.1-124.
- Parsani HR, Veer S, Momin RR (2008) Common Parasitic Diseases of Camel. *Vet. World*, 1(10):317-318.
- Pegram G, Higgins S (1992). Camel ectoparasites, Proc.1st Int.camel conf. Pp . 69-78.
- Pegram RG, Hoogstraal H, Wassef HP (1981). Ticks (Acari: Ixodidae) of Ethiopia. I. Distribution, Ecology and Host relationship of species infesting livestock. *Bull. J. Entomol. Res.* 71:339-359.
- Rabana JL, Kumshe HA, Kamani J, Hafsat G, Turaki UA, Dilli HK (2011). Effects of parasitic infections on erythrocyte indices of camels in Nigeria. *Vet. Res. Forum* 2:59-63.
- RAWAO (2010). Raya Azebo Woreda Agricultural Officeannual report.
- Richard D (1979). The diseases of the dromedary in Ethiopia. *Ethiop. Vet. Bull.* 2:46-67.
- Schwartz HJ, Dioli M (1992). The one humped camel in Eastern Africa. A pictorial guide to diseases, health care and Management. Verlag. Josef, Margraf Scientific books, Berlin. pp. 1-267.
- Thrusfield M (1995). Veterinary Epidemiology, Department of Veterinary Clinical Studies, University of Edinburg. pp. 178-179.
- Walker AR, Bouattor A, Camicas JL, Estrado-pena IG, Latif AA, Pegram RG, Preston PN (2003). Ticks of Domestic Animals in Africa; A Guide to Identification of Species. Bioscience Reports, Scotland, UK. Pp. 7-221.
- Wall R, Shearer D (2001). Veterinary Ectoparasite, Biology, Pathology and Control. 2nd edition, Blackwell Sciences Limited, UK. P 262.
- Woldemeskel M, Issa A, Mersie., Potgieter LND (2001). Investigation of parasitic disease of one-humped camel (*camelus dromedarius*) in eastern Ethiopia. *J. Camel. Pract.* 23:34-56.
- Zelalem T (1994). Survey on mange mites and ticks of camels and small ruminants in Dire Dawa Region, Eastern Ethiopia. D.V.M. Thesis F.V.M. A.A.U. Ethiopia. Pp.1- 25.
- Zelege M, Bekele T (2004). Species of Ticks on Camels and Their Seasonal Population Dynamics in Eastern Ethiopia. *Trop. Anim. Hlth. Prod.* 36:225- 231.