International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
(A Peer Reviewed, Referred, Indexed and Open Access Journal)
DOI: 10.22192/ijarbs Coden: IJARQG (USA) Volume 9, Issue 10 -2022

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2022.09.10.002

Prevalence and Identification of Ixodid Ticks Genera of Cattle in Digalu and Tijo District of East Arsi zone, Oromia, Ethiopia

Mohammed Aliye Tunfuri[*1], Gezali Abafaji Abafita[1] and Mogos Mekonnin Jima[2]

[1]School of Veterinary Medicine, Wollega University, P.O. Box: 395, Nekemte, Ethiopia
[2]College of Veterinary Medicine and Agriculture, Addis Ababa University, P.O. Box: 34, Bishoftu, Ethiopia
[*1]Corresponding Author: Mohammed Aliye Tunfuri,
Email: *aliyimohammed177@gmail.com*

Abstract

Ticks and tick borne disease cause considerable losses to the livestock economy. A cross- sectional study was conducted in Digalu and Tijo District, Arsi zone, from November, 2017 to April, 2018 to estimate the prevalence of major ixodid ticks on cattle and to identify the prevalent ticks to the genera level. Study animals were selected randomly. Out of the total of 384 cattle examined, 255(66.4%) were found to be infested by one or more ticks. About 756 adult ticks were collected from the animal body parts manually, preserved with70% ethyl alcohol and were identified to genera level by using stereo-microscope. From the total ticks collected, four genera's namely; Boophilus, Ambylomma, Rhipicephalus and Hyalomma were identified and account for, 63.5, 30.4, 3.5 and 2.6%, respectively. The association of the prevalence of tick infestation with different risk factors was assessed to be statistically significant between peasant association and, breed of cattle. However, it was statistically insignificant between the age, sex and body condition of animals. The study showed that ticks are important ectoparasites in the study area and induce huge economic losses which need attention in livestock productivity. Improving animal's husbandry and management to reduce the rate of infestation of these ticks is essential.

Keywords: Cattle**,** Digalu and Tijo, Ixodid tick, Prevalence, Stereomicroscope,

Introduction

Ethiopia is known for its high livestock population, being the first in Africa and tenth in the world. The recent livestock population estimated that the country has 59,486,667 heads of cattle, 30,697,942 of sheep, 30,200,226 of goats, 2,158,176 of horses, 409,877 of mules, 8,439,220 of donkeys and 59,495,026 of poultry (CSA, 2017). Among livestock, cattle play a significant role in socio-economic life of the people of Ethiopia. In addition to the products of meat and milk, cattle provide draught power for cultivation of the agricultural lands of many peasants. Skins and hides are also important components of the livestock sector in generating foreign export earnings (Morka *et al*., 2014, Solomon, 2005 and Kidane, 2001). Even though live stock provide such major importance for different people they are affected by different parasitic, bacterial, viral and fungal diseases which affects the skin which is 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 because of poor quality (Wendwossen, 2000; Kassa *et al*., 1998).

Among the different ectoparasites which affect the skin of animals ticks are the most prevalent of 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. 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 (FAO, 2004). Ticks are important vectors for diseases like Babesiosis, Anaplasmosis and Erlichiosis in domestic ruminants. They are known to exacerbate non specific disease symptoms like anemia, toxicosis and paralysis (Berihun *et al*., 2012; Morel, 1980). Approximately 80 % of cattle population of the world are at risk of tick infestation and tick born diseases (Kahn, 2010).

Ticks are obligate blood feeding ectoparasites of vertebrates particularly mammals, birds and reptiles throughout the world. Ticks are especially common and varied in tropical countries, where they cause considerable harm to livestock by transmission of many species of pathogens and causing direct parasitic damage. For an ecosystem to support ticks, the population density of the host species in the area must be high enough, and humidity must be high enough for ticks to remain hydrated (Rajput *et al*., 2006). There are two well established families of ticks, the Ixodidae (hard tick) and the Argasidae (soft ticks).Among the two families of ticks the most important one is the Ixodidae because of the existence of a rigid Chitinous scutum for males, which covers the entire dorsal surface, but in adult female, larva, nymph it extends only for a small area which permits the abdomen to swell after feeding. Based on the number of hosts required to complete their life cycle they can be classified as one-host, two-host and three-host ticks (Walker, *et al*., 2003).

In Ethiopia, several species of ticks belonging to the genus Amblyomma, Boophilus, Hyalomma, Rhipicephalus, and Haemaphysalis have been reported Existing records are suggestive of considerable losses to the livestock and the economy of Ethiopia, ranking it third among the major parasitic diseases prevalent in the country. The environmental condition and vegetation of Ethiopia was considered as highly conducive for the vectors, and the associated diseases they cause (Pegram, *et al.*, 1981).

Tick and tick borne disease are the main constraints of animal's health, products and their market value in developing countries as well as in Digalu and Tijo districts of Arsi zone due to poor farm managements or extensive system. In spite of losses due to tick infestation in Ethiopia, and a number of researchers reported the distribution and abundance of tick genera in different parts of the country, there is still many problems faced by livestock owners due to the ixoded ticks infestation particularly in Digalu and Tijo district. In addition, there is no work done regarding the above ecto-parasites in Digalu and Tijo district.

Therefore, the objectives of this study were

- To determine the prevalence of tick infestation and to identify the common genera of ticks infest bovine in the study area.

Materials and Methods

Study Area Description

The study was conducted in Digalu and Tijo District which is located at 181 km south of Addis Ababa. Digalu and Tijo is the district in the Oromia Region of Ethiopia and located in central part of Arsi and the main road from Addis Ababa to Bale crosses the District. The District is bordered on the south by Lemu Bilbilo, on the southwest by Munesa, on the northwest by Tiyo, on the north by Hetosa, on the northeast by Tena, and on the east by Sherka. The District has a diverse agro-ecology suitable for the production of different crops and livestock. The altitude of this district ranges from 2500 to 3560 meters above sea level (Dwiet et al., 2002). The day and night temperature of the area ranges from 10-22°C and 10-20°C respectively. The area has a bimodal rain fall occurring from March to April (short rainy season) and from July to October (long rainy season) with annual rainfall of 900-1400mm. The soils of the area had 44% red, 35% loam and 21% brown. Live stock population in the district include; 213167 cattle, 119544 sheep, 8170 goat, 23354 horse, 15560 donkey, 324 mule and 104830 poultry (DWOA, 2014).

Study design and study animals

A cross-sectional study was conducted from November, 2017 to April, 2018 to identify major tick genera and to determine their prevalence. The study population consists of cattle managed under extensive management system which constitute cross breed and local breeds with different age groups, sex and body condition categories. The age of the cattle were grouped into young (> 4year) and adult (<4 years) according to the classification method used by De-Lahunta and Habel (1986) .While body condition score were grouped into poor, medium and good according to (Nicholson and Butter worth, 1996). Ticks were collected from the half body regions of selected cattle and these ticks were examined to their genus level. The total tick burden was also determined by performing tick counting.

Sample Size Determination

The sample size was 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 and at 5% absolute precision using the formula indicated by (Thrustfield, 2007).

$$n = \frac{(1.96)^2 Pexp\ (1-Pexp)}{d^2}$$

Where, n = required sample size,
Pexp = expected prevalence,
d= absolute precision.

Therefore, 384 cattle were examined under the study

Sampling method

Simple random sampling was applied for tick collection of 384 cattle found within five peasant associations (PAs) of the Digalu and Tijo district. The PAs were selected based on their accessibility to transport and information from the Districts manager. The animals were selected and examined randomly from the household.

Data analysis

The data recorded was entered into Microsoft excel data base system for statistical analysis. SPSS version 20 statistical software was used to analyse the data. The association between tick infestation rate and study factors (such as age, sex, breed, body condition etc) was determined by chisquare (x2) test. A statically significant association between variables exists when $P<0.05$ and at 95 % confidence level (CI). The prevalence of tick infestation was calculated as the number of

positive animals for specific tick genus sampled divided by the total number of animals examined and multiplied by hundred.

Tick Collection and Preservation

Firstly, the selected study animals were properly restrained and half body of the animals selected as sampling unit was checked for any tick infestation. Ticks were removed from different body regions of the host skin for identification using hand manually (Wall and Shearer, 2001). The collected ticks were preserved in separate pre-filled universal bottles with 70% ethyl alcohol before transportation to Asella regional veterinary laboratory for identification with respect to date of collections, address, breed, age, sex and body condition score of the animals.

Laboratory Examination for Tick Identification

The collected ticks were identified in to different genera level by using stereomicroscope, according to standard identification keys given by Walker et al. (2003).

Results

From the total of 384 examined cattle, overall 255 (66.4%) were found to be infested by different genera of ticks. A total of 756 adult Ixodidae ticks were collected from half body region of infested cattle (Table 1). In general, four Ixodidae tick genera were identified from the study area. From identified generas; Bophilus (63.5%) was the most abundant and widely distributed genus followed by genus Ambylomma (30.4%) and Rhipicephallus (3.5%). However Hyalomma (2.6%) was found to be the least abundant genera (Table 1).

Table 1: Distribution of tick genera of cattle in study area

Genus	Percentage of total tick genera
Boophilus	63.5 %(480/756)
Ambylomma	30.4 %(230/756)
Rhipicephallus	3.5 %(26/756)
Hyalomma	2.6 %(20/756)

Higher tick prevalence was recorded in Ashabaqa Kebele (80%) and slightly lower prevalence in Tulu kite (53.5%) with statistical significant difference ($p < 0.05$). The occurrence of tick infestation in breed of animals was also significantly different ($p < 0.05$). Tick infestation of animals with sex, age and different body conditions showed that there were not statistically significant variations ($p > 0.05$).

Table 2: Potential risk factors for tick infestation status of cattle in Digalu and Tijo district

Risk factors	No of animal examined	No of positive animal	Prevalence (%)	Chi-square (X^2)	P- value
Kebele					
Ashabaqa	90	72	80%	14.274	0.006
Burkitu	58	40	69%		
Sagure mole	66	43	65.2%		
Bucho silase	84	54	64.3%		
Tulu kite	86	46	53.5%		
Breed					
Local	275	191	69.5%	4.035	0.045

Cross	109	64	58.7%		
Sex					
Male	186	129	69.4%	1.406	0.236
Female	198	126	63.6%		
Age					
Young	115	76	66.1%	0.008	0.931
Adult	269	179	66.5%		
BCS					
Poor	192	135	70.3%	3.617	0.164
Medium	123	80	65%		
Good	69	40	58%		
Total	384	255	66.4%		

BCS=Body Condition Score

Discussion

Different tick genera's are widely distributed in Ethiopia and a number of researchers reported the distribution and abundance of ticks in different parts of the country (Solomon *et al.*, 2001).

In the present study, the overall prevalence of ticks was found 66.4%. This finding was similary with previous finding from different part of the country with prevalence of 65.5 % (Wolde and Mohammed, 2014), and 68.8% (kumisa *et al*., 2017). The present result was lower than the prevalence of 82% by (Nateneal *et al*., 2015), 81.25 % by (Getachew *et al*., 2014), 75.3% by (Belay and Enyew, 2016) and 74 % by (Meaza *et al*., 2014). But the current finding was higher than the previous work of (Walker *et al*., 2003) 25.64%. The inconsistency among these studies could be attributed to a wide range of factors including agroecological, animal health practice, or management difference within their respective study areas.

Boophilus was the dominate tick identified followed by Amblyomma, Rhipicephalus and Hyalomma respectively. This finding is in agreement with the genera identified by Shane *et al*., (2017) and Mekonnen, (1991).This finding also partially agreed with Belew and Mekonin, (2011) who reported that the major tick genera recorded in tick distribution survey, made in Ethiopia were Ambylomma 40%, Rhipicephallus 37%, Boophilus 21% and Hyalomma 1.5%.This could be due to difference in the season during which the study was conducted (Mekonnen, 1995). Even though the percentage between Amblyomma and Boophilus differs it is common to find the four genera of ticks which were prevalent in Ethiopia. Rhipicephalus is the 3rd and Hyalomma is the 4th encountered tick genera in the area. In general; Boophilus and Amblyomma ticks constitutes highest percentage of the total collection. The Hyalomma and Rhipicephalus were found in limited number in our study site this is in agreement with the finding of Mekonin *et al*., (1995).

Risk factors (peasant association, breed, sex, age and body condition scores) were also involved in the variations of the prevalence of ticks in the study area. There was statistically significant ($P<0.05$) association of tick infestation between different Kebeles (Table 2). The percentage of tick infestation is highest in Ashabaqa (80%) and it is the least inTulu kite (53.5%). This difference in percentage is due to differences in management, society's awareness to treat tick infested animal and access to veterinary service.

There was statistical significant association between breed of animal. In addition higher prevalence of tick infestations recorded in local breeds (69.5%) than cross breeds (58.7%) (table 2).

The findings of our study was concomitant to the other findings in which there was a proven record of a prevalence rate of 58.18% in the local breed cattle and 10.55% in the cross breed in Haramaya district of east Ethiopia, as was indicated by Kassa and Yalew, (2012). This difference in tick infestation may have been attributed to the lack and or decrement in supplementary feed provided to the local cattle breeds.

The difference in prevalence between sex of cattle was found statistically insignificant (P >0.05). Female animals were found less affected than male (in female 63.6 % and in male it was 69 %).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 (Aerts and Neshem, 1999) in Bako.

The proportion of tick infestation was higher in adult animals as compared to young animals. However, there was no statistically significant association (p>0.05), and the greater prevalence rate may have been due to outdoor management, and movement of adult animals over long distances in the search of food and water in comparison to the younger animals, maximizing the chance of exposure to ticks.This finding is also in agreement with the finding of Belew and Mekonen,(2010), Tesema and Gashaw, 2010; Feseha, (1983)who stated a similar observation for a higher proportion of adult cattle being studied.

Body condition was not statistically significant in relation to tick infestation (p > 0.05). The proportion of tick infestation was higher in poor (70.3%) as compared to medium body conditioned (65%) and good body conditioned animals (58%). Several authors have reported high infestation of tick results in poor body condition due to consumption of high amount of blood and fluid by those ticks (Pawlos and Derese, 2013:Bianchi *et al*., 2003) who reported that the British cattle breeds having the lowest body condition score under tropical conditions had the highest infestation of ticks. It is reported that tick load on animal is affected by breed and nutritional stress. Ultimately, this factor affect general body condition, which in turn affects blood composition, respiration rate, appetite and eventually leads to poorer body condition scores (Gezali, 2010;Bianchi *et al*., 2003; kettle, 1995). This was due to poor body conditioned animals are less resistant to tick infestation and lack enough body potential to build resistance with age advancement

Conclusion and Recommendations

The present study was conducted to determine the prevalence of bovine hard ticks and the major genera in selected five Peasant Associations of Digalu and Tijo district. The result of the study indicated that ticks were the most wide spreaded and prevalent parasite affecting the health and productivity of animals with an overall prevalence of 66.4%. The important and abundant tick genera investigated in this research were Bophilus, Ambylomma, Rhipicephallus and Hyalomma respectively. In general, They reduce cattle productivity, such as milk yield, skin and hide quality and increase susceptibility to other diseases So, the present study demonstrated that bovine hard ticks being one of the most prevalent problems of most cattle breeders or farmers which need more attention. Based on above conclusion the following points are forwarded:

- ✓ Awareness creation should be given for stakeholders regarding socioeconomic effects due to ixoded ticks.
- ✓ Integrated control and prevention method should be implemented in order to combat the high prevalence of bovine ixodid ticks from and around the study area.
- ✓ More attention should be given to the selection of resistant cattle breeds.
- ✓ Improving animal's husbandry and management to reduce the rate of infestation of these ticks is essential.
- ✓ There should be collaborative work between the government, non-government,
- ✓

veterinary professionals and communities to bring tick infestation to the very minimum burden.

References

Aerts J. and Neshem O. 1999. Florida beef cattle external pest control survey.UF Pesticide Informatio Office:Report in Production. http://Edis. Ifas.ufl.edu/pdf files/PI/P104300.pdf.

Belay W. and Enyew M. (2016). Identification and Prevalence of Hard Tick in and Around Sude Woreda, Arsi Zone, Ethiopia, Journal of Health, Medicine and Nursing ,Pg 13-19.

Belew T. and Mekonnen A. 2011. Distribution of Ixodid ticks on cattle in and around Holeta town, Ethiopia. *Global Veterinarian*. **7**(6): 527-531.

Bianchi M., Barre V. and Messd S.2003. Factors related to cattle infestation level and resistance to acaricides in Boophilusmicroplus tick populations in New Calender. *Vet. Parasitol*, **112**: 75-89.

Bianchin I., Catto J., Kichel A., Torres R..and Honer M. 2007. The Effect of the Control of Endo- and Ectoparasites on Weight Gains in Crossbred Cattle (*Bos Taurus Taurus*×*Bos Taurus Indicus*) in the Central Region of Brazil. *Tropical Animal Health and Production*, **39**, 287-296.*http://dx.doi.org/10.1007/s11250-007-9017-1*

Central Statistical Agency (CSA) 2017. Agricultural, Report on Livestock and Livestock Characteristics (private peasant holding). **2:** Pp 37-188

Digelu-tijoWoreda Office of Agriculture DWOA.2014. Annual report for live-stock production.

Dwiet A.,Mohammed A.,Esmira L.,Sumbula M.,Guduru S. and Harish T.2002. Oppurtinitis for crop diversification and better crop livestock integration in the highlands of Arsi,Ethiopia. Working Document series 101.

FAO. 2004.Acaricide Resistance.Diagnosis, Management and Prevention. *Guidelines Resistance Management and Integrated Parasite Control in Ruminants*, Animal Production and Health Division,Agriculture Department,Food and Agriculture Organization of the Unitd Nations, Rome, 25-77.

Feseha G.1983. Notes on tick species and tick born disease of domestic animal. [DVM Thesis]. Debrezeit, Ethiopia: Faculty of Veterinary Medicine, Addis Ababa University; 1983.

Getachew A, Mersha C, Dessalegne M, Basaznew B. 2014. Prevalence of ixodid ticks on cattle in Northwest Ethiopia. Acta Parasitological Globalis. ;5(2):139 145,doi:10.5829/idosi.apg.2014.5.2.84292.

Gezali, A., 2010. Survey of cattle tick species and tick burden in and around MizanTefari town, DVM thesis, College of Agricalture and Veterinary medicine, Jimma university, Jimma, Ethiopia, pp: 18.

Kahn C. 2006. The Merck Veterinary Manual. 9th Edition, Merck and Co. Inc, White house Station.

Kahn, C. 2010. The merk veterinary manual, 9th edition, Anniversary editionmerial. National publishing. Inc. phidadelphia.

Kassa B., Bisrat V., Asegedech S. and Africa T.1998. Control of"EKEK" skin defect in sheep by insecticide and shearing. *In Proceedings of the 12th Annual Conference of Ethiopia.*

Kassa S and Yalew A.2012. Identification of Ixodide ticks of cattle in and around Haramaya district, Eastern Ethiopia. *Scientific Journal of Crop Science*. **1**(1):32-38

Kettle D.1995. Medical and Veterinary Entomology. 2ndEd. UK: CAB international. pp: 420-460.

Kumisa M.,Geremew H.,Negesse M. and Walkite F.2017. Prevalence and Identification of Bovine Ixodide Tick in Dandi District, West Shoa Zone, Oromia Region, Ethiopia. *SOJ* Vet Sci **3**(5): 1-8.

in livestock. Journal of Zhejiang University Science B, **7**(11): 912-921.

Meaza G., Abdu M.and Yisehak K. 2014. Determination of the prevalence of ixodid ticks of cattle breeds,their predilection sites of variation and tick burden between different risk factors in Bahir Dar, Ethiopia. Global Veterinaria.;**13**(4):520–529.

Mekonen S. 1991 .Tick and tick-borne disease control in Ethiopia. In: Proceeding of Joint OAU, FAO and ILRDA work shop held in Liongwe, Alwi, Pp: 19-20.

Mekonnen S. 1995. Ticks and Tick-borne diseases and control strategies in Ethiopia. In: Tick borne pathogens at the host vector interface.

Morka A., Zegeye A.and Eyob H.2014. Prevalence of Ixodid Ticks on Cattle in and Around Diga Town, West Ethiopia. College of Health Sciences, School of Veterinary Medicine. Wollega University, P.O. Box: 395, Nekemte, Ethiopia. European Journal of Biological Sciences. **6**(1):25-32. doi: 10.5829/idosi.ejbs.6.01.85154

Nateneal E., Fikadu M., Yimer H. and Jelalu K. 2015. "Identification and prevalence of ixodid tick bovine at Bedele district, Oromiyia Regional State, Western Ethiopia."*Journal of Parasitology and Vector Biology, vol*. **7**(8):156–162.

Nicholson M. and Butterworth T.1996.A guide to body condition score in Zebu cattle .International livestock center for Africa , Addis Ababa, Ethiopia.

Pawlos W.and Derese D.2013. Study on prevalence and identification of ticks in Humbo district, Southern Nations, Nationalities and People's Region (SNNPR), Ethiopia. *J.vet. Med. anim. Health*. **5**(3): 73-80.

Pegram R.,Hoogstraal H. and Wassef H.1981. Ticks (Acari: Ixodidae) of ethiopia. Distribution, ecology and host relationship of tick species infecting livestock.

Rajput Z., Hu S., Chen W., Arijo A.and Xiao C.2006. Review: Importance of ticks and their chemical and immunological control

Shane T., Gunse T.and Woldemariyam F. 2017. Identification of Tick and Tick Borne Hemo-Parasites in Tiyo District, Arsi Zone, Oromia Region. *J Vet Sci Technol* **8**: 418.

Solomon G.2005. Agriculture in Ethiopia: ICIPE tick modeling workshop held at Duduviell report on 9 – 19 October 1997 Nairobi, Kenya.

Solomon,G., Nigist M. and Kassa B .2001.Seasonal variation of ticks on calves at Sebeta in Western Shewa Zone. *Ethiopian Vet. J*.**7**(1&2): 17-30.

Tessema T. and Gashaw A.2010. Prevalence of ticks on local and crossbreed cattle in and around Assela Town, South East, Ethiopia, Amber Animal Health Department, East Gojam, *Ethiop. Vet J* . **14**(2): 79-89.

Thrustfield M. 2007.Veterinary Epidemiology.*Government Department of Navy Bureau, 3rd Edition.UK Black Well Science Ltd*:**18**.

Torr S., Eisler M., Coleman P., Morton J. and Ma chila N. 2003. Integrated Control of Tick s and Tsetse. *A Report for the DFID Advi sory and Support Service Contract, Projec t ZV. NRIternational Ltd*, 1-135.

Torres D. 2008. The Brown Dog Tick *Rhipicephalus sanguinus* (Acari: Ixodidae): From Taxonomy to Control. *Veterinary Parasito logy*, **152**, 173-185. *http://dx.doi.org/10.1016/j.vetpar.2007.12.030*

Urquhart G., Armour J., Dunean J., Dunn A. and J ennings F. 1996.Veterinary parasitology. 2nd Ed. Black Well Science. *The University of Glaskow, Scotland, UK*. 181-188.

Walker A, Bouattour A, Camicas J, Estrada-Pena A, Horak I, Latif A. 2003. Ticks of Domestic Animals in Africa: A Guide to Identification of Species. *Bioscience Report, Edinburgh*,1-221.

Walker A., Bouattour A., Estrada-pena I., Horak, A., Latif, R. Pergam

B.and Preston M.2003. Tick of domestic animal in Africa, Guide to Identification,

Tick Species. *Bioscience Reports*, 42 Comiston Drive, Edinburgh EH10 5QR, Scotland,U.K., Pp: 3-210.

Wall R. and Shearer D. 2001.Veterinary ectoparasites: Biology, Pathology and Control. *2nd ed. Blackwell science.*

Wendewossen A.2000). Sheep and goat skin diseases control initiatives in Amhara region. Ethiopian Veterinary Epidemiology Newsletter. 1-9.

Wolde A.and Mohamed A.2014.Prevalence of ixo did ticks on bovine in Soddo zuria districts Wolaita Zone. Ethiopia. Acta Parasitologi ca Globalis. **5**(3):188–197. DOI: 10.5829/idosi.apg.2014.5.3.85136ss

Access this Article in Online	
	Website: www.ijarbs.com
Quick Response Code	Subject: Veterinary Sciences
DOI:10.22192/ijarbs.2022.09.10.002	

How to cite this article:
Mohammed Aliye Tunfuri, Gezali Abafaji Abafita and Mogos Mekonnin Jima. (2022). Prevalence and Identification of Ixodid Ticks Genera of Cattle in Digalu and Tijo District of East Arsi zone, Oromia, Ethiopia. Int. J. Adv. Res. Biol. Sci. 9(10): 15-23.
DOI: http://dx.doi.org/10.22192/ijarbs.2022.09.10.002