
Preliminary cross sectional survey of tick species that infect goats at Maigatari International Market, Jigawa State, Nigeria, the effect of the ticks on the goats, and the tick control measures adopted by the goat owners and traders

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Abstract

Ticks are arthropod parasites that are known mainly for sucking the blood of their hosts and acting as vectors of disease causing agents in both animals and humans. This study was a preliminary cross sectional survey of tick species that infect goats at Maigatari International Market, Jagawa State, Nigeria, their effects on the goats, and tick control measures adopted by the goat owners and traders. A total of 400 goats of varied breeds, ages and sexes were surveyed at the market in December 2023. The ticks were systematically collected at weekly intervals at the market and identified following standard procedures. One hundred and twenty goat owners and 50 goat traders were interviewed on tick control measures that they adopt. Results showed that out of the 400 goats surveyed, 23 (5.75%) were infested with ticks. Seven (1.7%) of the goats were infested with *Argas* spp, nine (2.25%) with *Hyalomma* spp, and another seven (1.7%) with both *Hyalomma* and *Argas* spp combined. The breed distribution of goats infested with ticks was: Balami – 6 goats (1.5%), Uda – 5 goats (1.25%), West African Dwarf goats – 2 (0.5%), and Yankasa – 10 (2.5%). Significantly ($p < 0.05$) higher number of young goats (9.09%) were infested with ticks when compared with adults (5.45%). There was no significant association ($p > 0.05$) between occurrence of tick infestation and sex (females – 5.03%; males – 6.47%). Observed effects of the ticks on the goats included anaemia, irritation, restlessness, other behavioural changes and skin lesions. Majority (70.6%) of the goat owners and traders used acaricides to control ticks, but a small percentage manually removed the ticks – hand removal 5.88%), used smoke (15.29%) and potash dust (6.8%) for tick control. It was concluded that the occurrence of tick infestation of goats in the sample population was low (5.75%), most probably because a very high proportion of the goat owners/traders use acaricides to control the ticks.

Keywords: Ticks; Occurrence; Goats; Cross-sectional survey; Maigatari International Market; Jagawa State, Nigeria.

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Introduction

Ticks are arthropod parasites that are of considerable medical and veterinary importance globally and they rank second to mosquitoes as vectors of disease agents to humans and animals (Danta-Torres, 2018). Infestation with ticks is a common problem in the Nigerian sheep and goat production industries, as it causes significant economic losses due to its effects on health and productivity of animals. Ticks as blood feeding parasites can transmit to sheep and goat diseases such as anaplasmosis, babesiosis etc., and these lead to the poor growth, weight loss, damage to the skin, decreased productivity, anaemia and sometimes death in severe cases (Sajid et al., 2007; Lynn et al., 2015). According to Dolan (1991), more than 80% of animal population of the world is infested with ticks. The common species of ticks are *Hylomma*, *Haemaphysalis sulcata* and *Rhipicephalus sanguineus* (Ramzan et al., 2021). In 1984, FAO estimated that the global cost of tick infestation annually was about 7 billion USD (Jobir and Gure, 2021). The degree of tick infestation on small ruminant can vary depending on factors such as climate, pasture condition, and farmer management practice (Abdally et al., 2020).

Goats (*Capra hircus*) are a species of domesticated goat-antelope that is mostly kept as livestock. It was domesticated from the wild goat (*C. aegagrus*) of Southwest Asia and Eastern Europe (Zeder, 1999). The goat is a member of the family Bovidae (Hirst, 2008). Goats are raised for milk, meat and wool (Augustyn, 2024). There is inadequate information in available literature on tick infestation of small ruminants, especially goats (*Capra hircus*) in the study area (Maigatari, Jigawa State, Nigeria), where subsistence goat farmers rely on these animals for sustenance and income. The present study evaluated the tick species that infest goats at Maigatari International Market, Jigawa State Nigeria,

their effects on the goats and the control measures applied by the goat owners/traders.

Materials and Methods

Study Area: The study was conducted at Maigatari International market, located in Maigatari Local Government Area, Jigawa State, Nigeria. The town is situated in the northeastern part of Nigeria, near the border with Niger Republic. The market is a prominent commercial hub that attracts buyers and sellers from various parts of the Jigawa State and neighboring Niger Republic. The market operates on a weekly basis, typically on Thursday. It is known for vibrant trading activities, affording a wide range of goods and commodities such as grains, vegetables, fruits, clothing and livestock, both for wholesale and retail purposes.

Study Design: The study design was a cross-sectional survey design, conducted on goats presented for sale (Figure 1) at the Maigatari International Market, Jigawa State Nigeria, during the month of December (December 01 – 31) 2023.

Collection of Ticks from the Goats: A total 400 goats were evaluated for tick infestation; they were physically examined for ticks. The ticks found were carefully collected using forceps and/or by hand picking and preserved in labeled sample bottles containing methanol, for further identification at the Entomology and Parasitology Laboratory, Department of Veterinary Parasitology, Faculty of Veterinary Medicine, Ahmadu Bello University Zaria, Nigeria. The Walter (2003) taxonomic key was used for identification of the ticks. Data on the sex, breed and age of the goats surveyed and those infested with ticks were also collected and recorded.

Interview Schedule for Goat Owners/Traders: One hundred and twenty goat owners and fifty goat traders were interviewed on the

methods and procedures they used to control tick infestation on the goats.

Data Analysis and Presentation: Data obtained in the study was subjected to descriptive statistics and Chi square where appropriate, using the SPSS software version 23 for Windows. Results were presented as percentage occurrence in bar charts.

Results

The study population of 400 goats was made up of four breeds of goats (Balami, Uda, West African Dwarf Goats (WADG) and Yankasa), 33 young goats and 367 adults, and 199 females and 201 males. Twenty three goats out of the 400 surveyed (5.75%) were infested with ticks (Figure 2). The species of ticks identified included *Argas* spp (7 goats out of the 400), *Hyalomma* spp (9 out of the 400 goats), and mixed *Argas* and *Hyalomma* spp. infestation (7 out of the 400 goats) [Figure 2]

The distribution of the tick infestation based on the breed of goats were: Balami goats –

1.5% (6/400), Uda breed – 1.25% (5/400), WADG – 0.5% (2/400) and Yankasa – 2.5% (10/400) [Figure 3]. Three out of the 33 young goats surveyed were infested with ticks (9.09%) while 20 out of the 367 adults (5.45%) were infested with ticks (Figure 4). Out of the 199 female goats surveyed ten (5.03%) had tick infestation while out of the 201 males 13 (6.47%) had ticks (Figure 5). There was no significant association between sex and tick infestation ($p > 0.05$).

The observed adverse effects of the ticks on the goats were anaemia manifest as paleness of the mucous membranes (3/400), behavioural changes (14/400), restlessness (18/400), skin lesions (2/400) and irritation (13/400) [Figure 6]. Results of the interview schedule showed that majority of the goat owners/traders (70.6%) used acaricides to control ticks on the goats, while relatively small proportions of the goat owners/traders manually remove the ticks (5.88%), use smoke (15.29%) or potash dusting (6.8%) [Figure 7].



Figure 1. Goats presented for sale at the Maigatari International Market, Jigawa State, Nigeria.

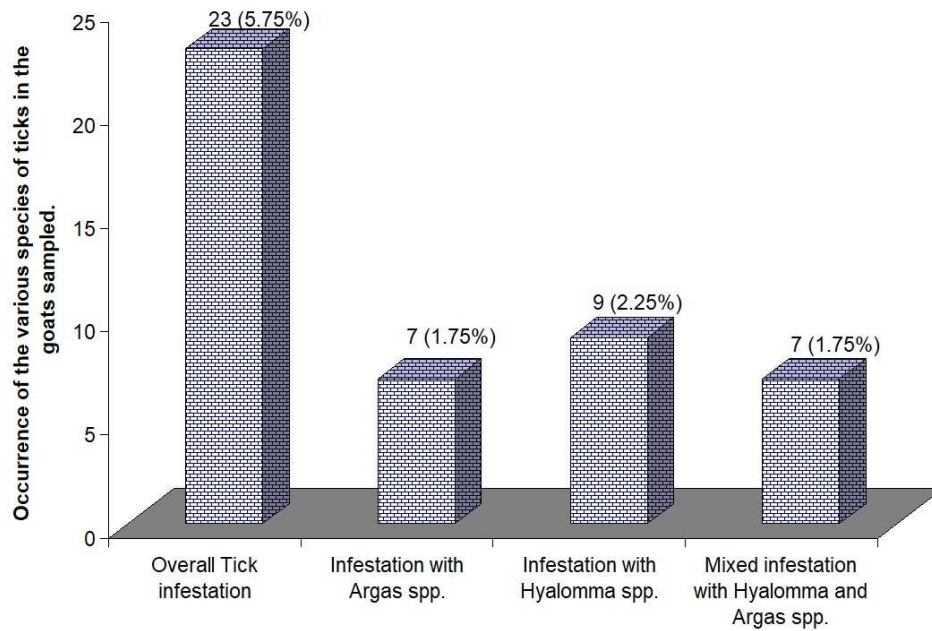


Figure 2. Occurrence of various species of ticks in the goats surveyed at the Maigatari International Market, Jigawa State, Nigeria.

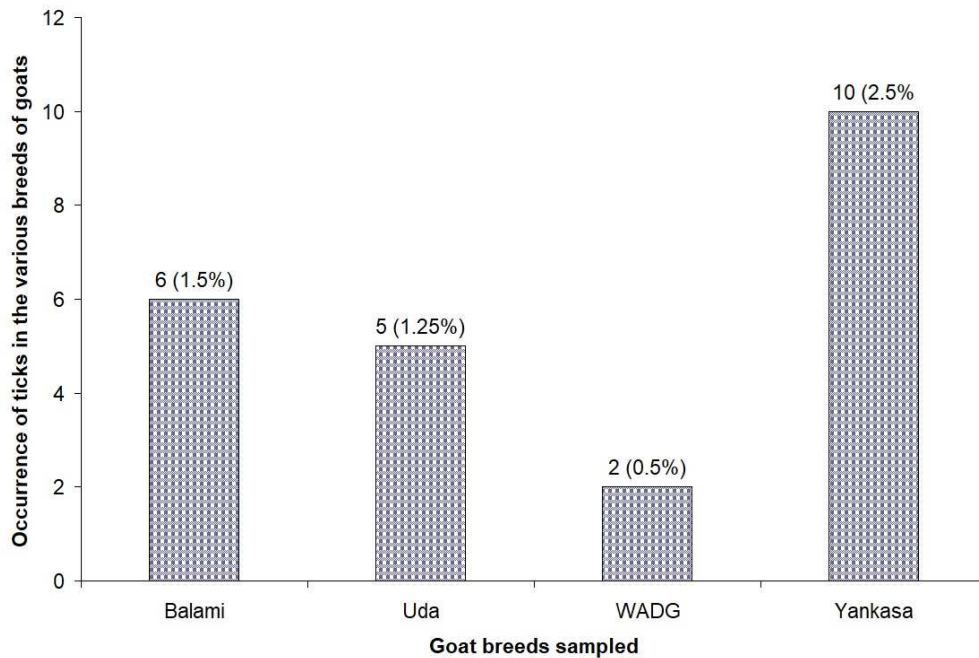


Figure 3. Distribution of tick infestation among the goat breeds surveyed at the Maigatari International Market, Jigawa State, Nigeria.

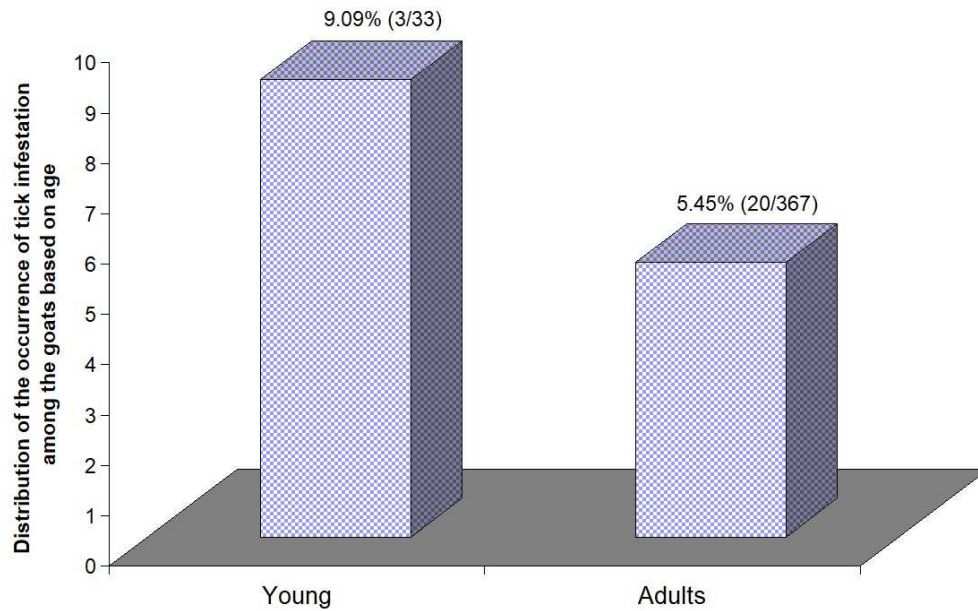


Figure 4. Age based distribution of tick infestation among the goat breeds surveyed at Maigatari International Market, Jigawa State, Nigeria.

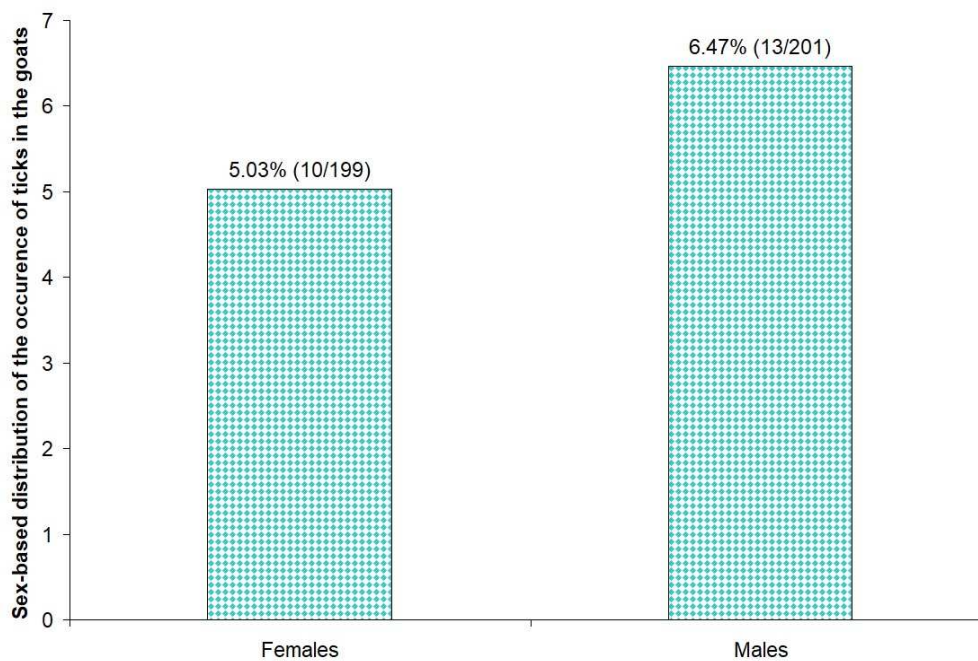


Figure 5. Distribution of occurrence of tick infestation among the sexes of goats surveyed at the Maigatari International Market, Jigawa State, Nigeria.

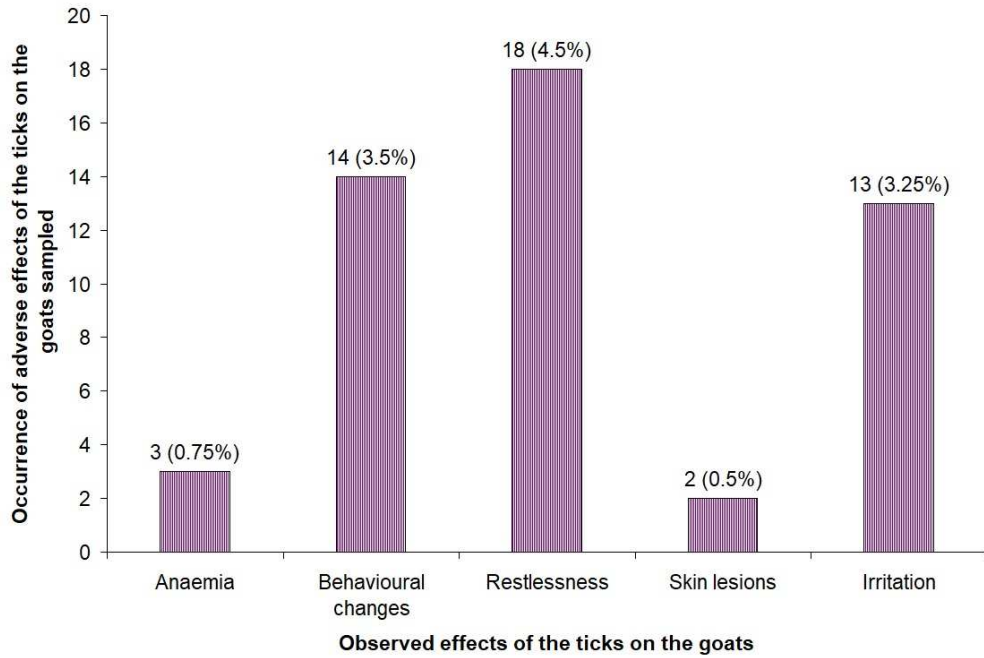


Figure 6. Distribution of the observed adverse effects of ticks on the goats surveyed at the Maigatari International Market, Jigawa State, Nigeria.

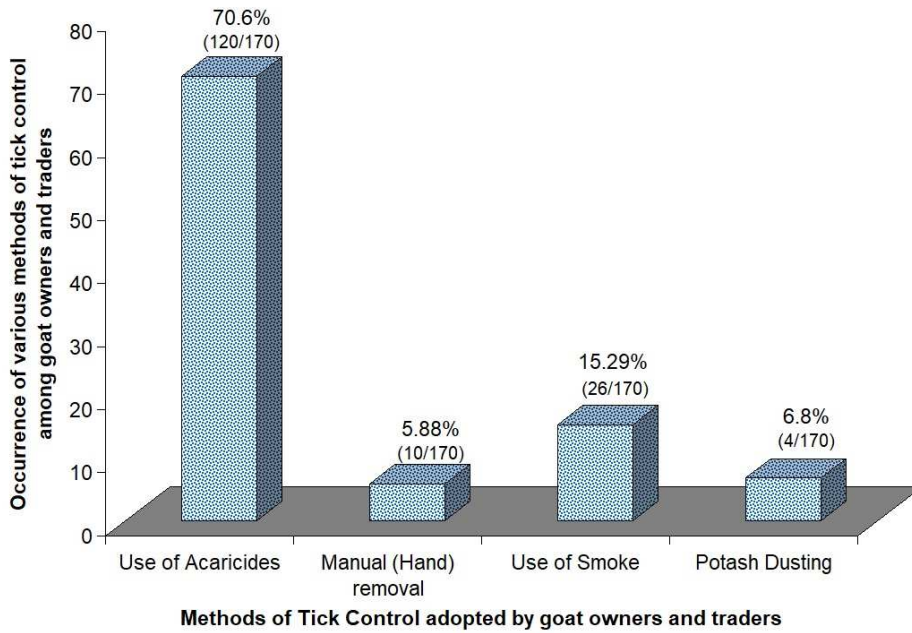


Figure 7. Various methods adopted by goat owners and traders in controlling ticks at the Maigatari market, Jigawa State, Nigeria.

Discussion

The 5.75% overall occurrence of tick infestation recorded in the present study is relatively lower than earlier reports of 23% occurrence on goats in North Central Nigeria by Elelu *et al.* (2022), 23.52% on goats in Al-Ahsa Oasis in Eastern region of Saudi Arabia (Abdally *et al.*, 2020), 34% on goats in Lowland Nepal (Kunwar *et al.*, 2022), 49.6% on goats in Ilam County Iran (Monfared *et al.*, 2013) and 85.26% on goats in Benatsemay District, South Omo Zone of South Western Ethiopia (Kifle *et al.*, 2021). It is thought that the relatively lower occurrence recorded in this study was because the present study was market-based study in contrast to those reported which are field/farm-based studies; most farmers will bring their best to the market and will have done the much they can to remove ticks from the goats before bringing them to the market, because the presence of ticks on the body may adversely affect (depreciate) the market value of the goats.

It is worthy to note that only two species of ticks were recorded in this study (*Argas* spp and *Amblyomma* spp) in contrast to earlier reports that reported more than four species of ticks infesting goats (Monfared *et al.*, 2013; Abdally *et al.*, 2020; Kifle *et al.*, 2021; Kunwar *et al.*, 2022). The relatively small sample number (400 goats) and limited time of the present study (one month) may have accounted for the limited species recorded in the present study.

The higher occurrence of tick infestation in the Yankasa breed relative to others suggests that the Yankasa breed may be more susceptible to tick infestation than others, while the lowest occurrence recorded for the WADG may be attributed to their renowned resistance to parasite infestations and diseases (Hoste *et al.*, 2015; Asmare, 2021). The higher proportion of young goats infested with ticks relative to adults is believed to be due to stronger resistance of adults to infestation. The higher

occurrence in males than females in the present study is in contrast to reports by Kunwar *et al.* (2022) that female goats are more infested than males in Lowland Nepal.

The recorded adverse effects of the ticks on the goats are in agreement with earlier reports by Sajid *et al.* (2007) and Danta-Torres (2015). The very high proportion of goat owners/traders who use acaricides to control ticks is worthy of note, and may be responsible for the recorded overall low occurrence.

In conclusion, based on the results of the study, the overall occurrence of tick infestation on goats at Maigatari International Market, Jigawa State, Nigeria was 5.75%, with the Yankasa breed of goats being more infested than other breeds. The two tick species recorded on the goats were *Argas* spp. and *Hyalomma* spp. Young and male goats had higher occurrence of infestation, and most of the goat owners/traders used acaricides to control tick infestation.

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Conflict of Interest

The authors declare that there is no conflict of interest.

References

- Abdally MH, Al-Marri TM, Abdally HM, Al-Jabr OA (2020). Incidence and prevalence of hard ticks in ruminants of Al-Ahsa Oasis Region, Kingdom of Saudi Arabia. *World Veterinary Journal*, 10(3): 276 – 285.
- Asmare K (2021). Small ruminants' diseases and genetic disease resistance in Africa: a review. Agricultural Research Knowledge Collections. International Centre for Agricultural Research in Dry Areas (ICARDA), Addis Ababa, Ethiopia.
- Augustyn A (2024). Goat. Encyclopaedia Britannica. [Britannica.com/animal/goat](https://www.britannica.com/animal/goat).
- Danta-Torres F (2018). Species concept: what about ticks? *Trends in Parasitology*, 34(12): 1017 – 1026.
- Elelu N, Ola-Fadunsin SD, Bankole AA, Raji MA, Ogo NI and Cutler SJ (2022). Prevalence of tick infestation and molecular characterization of spotted fever Rickettsia massiliae in Rhipicephalus species parasitizing domestic ruminants in North Central Nigeria. *PLoS One*, 17(2): e 0263843.
- Dolan TT (1991). Ticks and Tick-borne Diseases Control. Proceedings of a Joint OAU, FAO and ILRAD Workshop held in Kampala, Uganda, 12 – 14 September, 1991.
- Hirst KK (2008). The History of the Domestication of Goat. Wayback machine about.com.
- Hoste H, Sotirak S and Alvinerie M (2015). Novel approaches to the control of parasites in goats and sheep. *Parasite*, 22: 7.
- Jobir D and Gure M (2021) (2021). Study prevalence of hard tick infestation at South Western Kafa Zone Cheta Woreda, *International Journal of Advanced Research in Biological Sciences*, 8(6): 206 – 223.
- Kifle T, Mathewas M, Fesseha H, Abate A and Wolde A (2021). Study on prevalence of Ixodid ticks of goats and acaricide utilization practices of herd owners in Benatsemay District, South Omo Zone, South-Western Ethiopia. *Veterinary Medicine Research and Reports*, 12: 225 – 233.
- Kunwar A, Shakya SR and Ghimire TR (2022). Diversity and prevalence of ticks in the goats in Lowland Nepal. *Annals of Parasitology*, 68(2): 287 – 296.
- Lynn C, Anderson J, Glen M, Whayi T and Kathleen R (2015). Laboratory Animal Medicine (3rd Edition), pp. 623 – 694.
- Monfared AL, Mahmoodi M and Fattahi R (2013). Prevalence of ixodid ticks on cattle, sheep and goats in Ilam County, Ilam Province, Iran. *Journal of Parasitic Diseases*, 39(1): 37 – 40.
- Ramzan M, Murtaza G, Satter SA, Munawar N, Ullah A, Ejaz A, Ayaz F, Anwar S, Jameel K and Kamran F (2021). Techniques for managing tick and Tick borne diseases under changing climate: A review. *Egyptan Academic Journal of Biological Science*, 13(1): 117 – 128.
- Sajid MS, Iqbal Z, Khan MN and Muhammad G (2007). Effect of *Hyalomma* on milk product of dairy buffaloes. *Italian Journal of Animal Science*, 6: 939 – 941.
- Walter AA, Bouattour JL, Comicas A, Estradapena IG, Horak AA, Litif RG, Preston PM (2023). Ticks of Domestic Animals in Africa: A Guide to Identification of Species, Bioscience Report, Edinburgh.
- Zeder MA (1999). Animal domestication in the Zagros: A review of past and current research. *Palorient*, 25(2): 11 - 25.