Iraqi Journal of Veterinary Sciences

www.vetmedmosul.com

Measures of parasitism of the hard ticks (Acari: Ixodidae) infesting goats Capra aegagrus in Basrah province, Iraq, with remarks on ecology

A.N. Hatem[1] and A.T. AbdulKarim[2]

[1]Department of Biology, College of Education for Pure Sciences, University of Basrah, [2]General Directorate of Education in Basrah Governorate, Basrah, Iraq

Article information

Article history:
Received July 24, 2022
Accept March 29, 2023
Available online June 09, 2023

Keywords:
Hard ticks
Ixodidae
Goats
Basrah
Iraq

Correspondence:
A.N. Hatem
alaa.hatem@uobasrah.edu.iq

Abstract

Goats are one of the essential economic animals in Iraq. Many species of ticks parasitize goats, and cause systemic diseases worldwide. The study was designed with a total of 240 goats in Basrah province, southern Iraq, from January to June 2021. 110 of 240 (45.83%) examined goats were infested with ixodid ticks. Samples of ticks identified to the species based on morphological features, using the taxonomic keys. Several phenotypic features performed the diagnosis. Six species of ixodid ticks were identified: *Hyalomma anatolicum*, *Hyalomma excavatum*, *Hyalomma dromedarii*, *Hyalomma scupense*, *Rhipicephalus sanguineus*, and *Rhipicephalus turanicus*. The species *H. scupense* was recorded in the South of Iraq for the first time. Goats have recorded a new host of the species *H. dromedarii* in Iraq. The species *H. anatolicum* recorded the highest rates in prevalence, mean intensity, and relative density, while *H. dromedarii* was the lowest. The number of female ticks was higher than that of males; the total number of ticks collected was mostly engorged females, while, the larvae were the lowest. The concurrent infestation of goats with ixodid ticks' species ranged between single and quadruple infestation. The highest numbers of ticks were isolated from the face, ear, udder, tail, testes, thighs, and axilla on the body of infected goats.

DOI: 10.33899/ijvs.2022.134831.2409,

Introduction

Ticks are ectoparasites of mammals, birds, and reptiles (1). Eight hundred forty tick species have been described worldwide (2). The ticks are classified into two prominent families, namely the hard ticks Ixodidae, due to the dorsal shield, and the soft ticks Argasidae, by their flexible leathery cuticle (3). The family Ixodidae comprises nearly 80% of all tick species; It includes species of medical and veterinary importance (4). All adults and immature stages take a blood meal only once or for extended periods (5). Most ticks require three or two hosts to complete the life cycle, but some need one host, sucking blood from domestic and wild animals such as cattle, goats, and dogs (6). Ticks are of veterinary importance because they are vectors of many pathogens such as viruses, bacteria, rickettsia, protozoa, and nematodes (7). The pathogens typically transmit to hosts while the ticks feed or defecate, including anemia, hemorrhage, dermatitis, and skin necrosis (6). Some critical diseases transmitted by ticks to economic animals are Rocky Mountain spotted fever, Bovine anaplasmosis, Lyme borreliosis, theileriosis, Tick borne fever, ehrlichiosis, babesiosis, and tick paralysis (2). Ticks pests cause economic effects by limiting production in the livestock industry, such as cows, sheep and guts (8). Many vector-borne diseases are distributed cross borders, disrupting the traditional geographic distribution, leading to the recognition of many tick-borne diseases as significant disease threats (9). Goats are one of the crucial economic livestock in Iraq. Many species of ticks parasitize goats, causing some systemic diseases worldwide (2). Ticks feed on specific sites of the host's body, especially the face, ears, neck, armpits,

udder, groin, limbs, and anus (4). External signs associated with tick parasitism on goats include pustules, papules and alopecia, which can lead to bacteria entering the skin, leading to abscesses, and subsequently bacteremia and septicemia (6).

This study was conducted to diagnose ixodid tick's species that infested goats in Basrah province, located in the South of Iraq, and to determine ticks' prevalence, some ecological aspects, and seasonal occurrence.

Materials and methods

Ethical approve

The approval was given to carry out this scientific research by the College of Education for Pure Sciences, University of Basrah in the book No. 3/7/261 on 14/9/2021.

Study area

This study has carried out in Basrah Province, South of Iraq. This area is confined nearly within 45˚- 48˚ longitude and 30˚-32˚ latitude. In the north of this region are the Tigris and Euphrates flows. Shatt al-Arab River and some of seasonal ponds and marshes are in the middle. Basrah province is surrounded by Arabian Desert (East), Arabian Gulf (South), and Karon Plain (West). The lands of this state are agricultural plains, residential lands, semi-desert lands and deserts. The survey was done in nine locations distributed all over Basrah Province, as follows: Qurnah, Mudainah, Haritha, Dair, Shat Al-Arab, Basrah City, Zubair, Abu Al-Khaseeb, and Fao. Many farmlands, animal husbandry stations, and slaughterhouses were visited.

Ticks' collection and identification

A total of 240 goats of different breeds, gender and ages were examined for ticks' infestation. The goats were found in many locations in Basrah province, 40 each month, from January to June 2021. This period was chosen because it is almost similar to the second half of the year in terms of climatic conditions in Iraq. Samples of hard ticks were collected from the face, ears, neck, armpits, udder, groin, limbs, and anus of individual goats, using fine forceps, cotton, and ethanol. The samples were kept in insect box and recorded at the date and place of collection. Samples of hard ticks were identified to the species level based on morphological characteristics, using the following (2,7,10,11). The diagnosis was performed by several phenotypic features, size, coloration, capitulum, scutum, legs, spiracles, anal plates and festoons. The results of the classification results were sent to Iraqi Museum for Natural History at Baghdad University for more confirmation.

Parasitism measures for hard ticks

Parasitism measures for hard ticks were calculated (12) according to the following; Prevalence = number of individuals of a goats infested with a particular ixodid ticks' species ÷ total number of examined goats × 100. Abundance = number of individuals of each tick species in a sample of goats ÷ total number of all tick's species collected × 100. Mean intensity of tick = total number of individuals of a specific tick species in a sample of goats ÷ number of infested individuals of the goats in the sample. Relative density of tick = total number of individuals of a specific tick species in a sample of goats ÷ total number of individuals of the goats (infested + noninfected) in the sample. Patterns (Concurrent) of tick infestations: Number of tick species infested in each goat.

Some field observations of the ecology of ticks infested goats were also recorded. The sites of infestation in goats' bodies were determined. The age composition of ticks' population was recorded. The monthly occurrence of the tick's infestation during the study period were recorded, and temperature means and relative humidity rates for the months in the study period were calculated in the field. Then, the relationships between the presence of infestations were showed, and the variations in the climatic factors temperature and relative humidity observed.

Statistical analysis

The data of study's data were analyzed with a t-test and chi-square analysis using the computerized Statistical Program for Social Sciences (SPSS). $P<0.05$ was considered least limit of significance (13).

Results

The survey recorded that 105 of 240 examined goats were infested with hard ticks in Basrah province from January to June 2021. The total prevalence of tick infestations was 43.75%. Table 1 showed that six species of ixodid ticks were isolated from goats: *Hyalomma anatolicum*, *Hyalomma excavatum*, *Hyalomma dromedarii*, *Hyalomma scupense*, *Rhipicephalus sanguineus*, and *Rhipicephalus turanicus*. The species *H. scupense* was recorded in the South of Iraq for the first time. Goats were recorded as a new host of *H. dromedarii* in Iraq. The species of the genus *Hyalomma* have mostly infested goats in Basrah province with 61.71%, while *Rhipicephalus* was 38.29%. Table 1 also showed that the most prevalent species of ticks was *H. anatolicum* with 29.73%, followed by *R. turanicus* with 26.58%, but without significant differences, whereas *H. dromedarii* was the lowest with 3.60%. The results also explained that the species *R. turanicus* recorded the highest number of individual of ticks with 28.15%, followed by *H. a. anatolicum* with 26.66%, while *H. dromedarii* was the lowest with 4.64%. The statistical analysis of the data recorded some significant differences between the abundances of hard ticks' species and individual numbers. The data in Table 1 also showed also some variations in mean intensity of ixodid ticks' species infested goats. The highest mean intensity was recorded by *R. turanicus* with

1.62, whereas *H. dromedarii* was the lowest with 0.27. The statistical analysis did not show any significant differences between the mean intensities of the hard ticks' infestations. There are some variations in the relative densities of the ixodid tick's species. For instance, *R. turanicus* recorded the highest relative density with 0.71, while *H. dromedarii* was the lowest with 0.12. There are statistically significant differences between the relative densities of the hard ticks' infestations in goats during the study periods. The patterns (concurrent) of infestations of ixodid tick's species were varied between single to four. The double infestations were the highest with 49.09%, whereas the quadruple infestations were the lowest with 3.63% (Figure 1). The statistical analysis showed significant differences among the infestation.

Table 1: The prevalence of hard ticks infesting examined goats in Basrah province from January to June 2021

Species	infested	prevalence%	ticks collected	abundance%	mean intensity	relative density
H. anatolicum	66	29.73	161	26.66	1.56	0.67
H. excavatum	45	20.27	128	21.19	1.22	0.53
H. dromedarii	8	3.6	28	4.64	0.27	0.12
H. scupense	18	8.11	51	8.44	0.49	0.21
Rh. sanguineus	26	11.71	66	10.93	0.63	0.28
Rh. turanicus	59	26.58	170	28.15	1.62	0.71

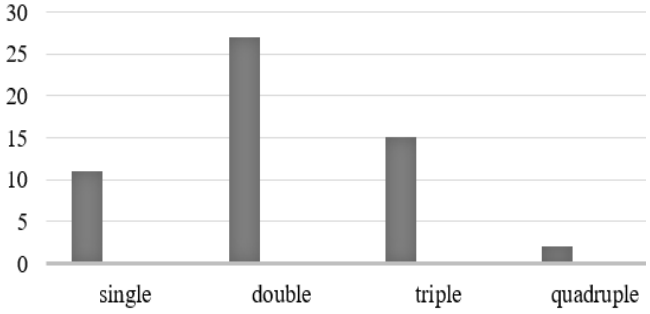

Figure 1: Patterns of goats' infestation of hard ticks (concurrent) in Basrah province during the study period.

Some ecological observations of hard ticks parasitizing goats were studied. The data in table 2 showed the distribution of ticks according to gender. The number of collected females was higher than that of males, with 56.13% to 43.87%, and the sex ratio was 0.78. Table 2 also showed that the total number of ticks collected was mostly engorged females with 30.46%, followed by fed males with 25.17%, but without a significant difference. The larvae were the lowest collected number with 5.13%. The statistical analysis of the data was recorded some significant differences among the number of life cycle stages. The observations during the ticks' collections recorded the sites of attacks of the tick on the infested goats' bodies. The highest number of ticks was isolated from the face, ear, udder, tail, testes, thighs, and axilla. The species *H. anatolicum* is found in all body parts except the neck, and *R. turanicus* from five sites. At the same time, *H. dromedarii* isolated from ear and legs only (Table 3).

Table 2: Age composition of hard tick's species isolated from goats in Basrah province during the study period

Species	Collected ticks	Engorged female	Fed male	Unfed female	Unfed male	Nymph	Larvae
H. anatolicum	161	44	40	30	25	13	9
H. excavatum	128	40	31	21	21	12	8
H. dromedarii	28	11	4	8	8	2	0
H. scupense	56	15	14	12	12	2	1
Rh. sanguineus	66	22	16	10	9	5	4
Rh. turanicus	170	52	44	30	24	10	9
Total	604	184	152	111	82	44	31
%	100	30.46	25.17	18.38	13.58	7.28	5.13

The seasonal occurrence of hard ticks' infestation in goats in the present study showed some variations in the monthly appearance from January to June 2021. The relationship between the infestation rates of hard ticks and the climatic factors as temperature and humidity (Figure 2). It was concluded that there was a correlation between temperature and relative humidity with the number of goats' infestations. The distribution of ticks according to months showed that it was highest in May with an infestation rate of 22.86%, followed by April 20.95%, but without significant differences. The lowest rate of infestations was recorded in January with 8.57%, and February at 10.48%. The statistical

analyses of the data observed some significant differences between the infestation rates in the months. The tick infestation rates in April, May, June and March significantly outperformed January and February. According to figure 3 the percentage of collected specimens of *H. anatolicum* was highly distributed in January, April, and March with 43.45%, 31.25%, and 29.27%, respectively. *R. turanicus* was highly distributed in May and June, with 29.82 and 34.55%, respectively. *H. excavatum* recorded the highest occurrence of ticks in February with 33.33%. In contrast, the collected number of *H. dromedarii* was the lowest in all months of the study periods. Statistical analysis of the data showed many significant differences between the collection rates for each species according to the months of the year, and between different species.

Table 3: Differences among hard ticks' species isolated from goats in terms of the attachment site of the host body

Species	Face	Ear	Neck	Axilla	Groin	Udder	Other
H. anatolicum	+	+	-	+	+	+	+
H. excavatum	-	+	+	+	-	-	+
H. dromedarii	-	+	-	-	-	-	+
H. scupense	+	-	-	+	+	-	-
Rh. sanguineus	-	+	+	-	-	+	-
Rh. turanicus	-	+	-	+	+	+	+

(+) infested, (-) non infected.

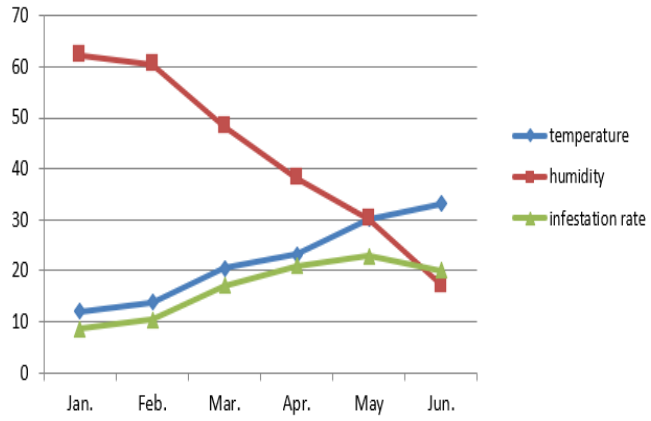

Figure 2: The relationship between temperature and relative humidity with goats infested with ticks during the study period.

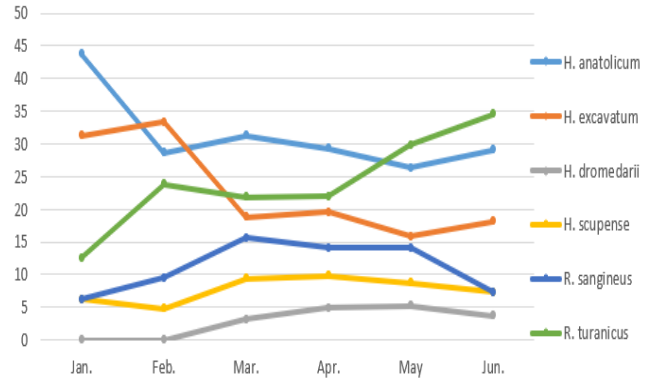

Figure 3: Monthly occurrence of parasitic hard ticks on goats during the study period.

Discussion

There is limited taxonomic, ecological and epidemiological information on ticks in Basrah in southern Iraq, although this area has a favorable climate for ticks and host diversity. Some studies about ticks parasitizing goats by Awad and Abdul-Hussein (14), Hatem (15), Hatem and Al-Asadi (16), Al-Mayah and Abdul-Karim (17) studied hard ticks in Basrah province. Hasson (18), Mohammad (19), and Al-Fatlawi (20) studied ticks in the Middle and South of Iraq. Kadir *et al.* (21), Al-lahaibi and Al-Taee (22), Mustafa (23) worked in Northern Iraq. Ismael and Omer (24), Hiewa and Dyary (25), Mansoor *et al.* (26) reported on identification of blood parasites transmitted by ticks in Iraq. The present study and others in Iraq showed that genera *Hyalomma* and *Rhipicephalus* are the dominant ticks in the number of species and specimens collected. Species belonging to the genus *Hyalomma* are most prevalent in the regions of North Africa and the Middle East (4).

The diversity of ixodid ticks' species varied between the results of this study and the others might be due to the difference in the geographical areas, and environmental factors. The variations in tick diversity are due to climate change, geographic location and hosts (27). Ecological and climate changes impact tick's biodiversity; the changes altering tick population dynamics (28). Some biological conditions influence ticks' occurrence, such as the morphology of the host, host immune responses, inter-specific interactions, and length of the feeding phase (5).

Depending on the body parts, there were some differences in density, attachment site and proportion of tick life stages. Factors that affect ticks feeding include tick density, host defenses, and the ages of the host and tick (29). The stages of ticks select different body sites for attachment; the attachment site selection reflects the life stages varying

in the ability to move (30). Attachment, engorgement, and subsequent development of successive infestations of tick's larvae and nymphs occur on natural hosts (31). The population of ticks differs in a given region depending on climatic fluctuations, land structure and vegetation (32). The larvae of ticks are often found on the legs and ears, and the larvae feed on the ears and some legs, while the adults reside in a larger area in the body from the head to the udder (33). Ticks may compete for parasitizing sites on the host, resulting in reduced feeding success at higher densities (34). Feeding success decreased at higher larval densities on standard experimental mice, while no change in feeding success was seen at higher densities when feeding on a natural host (35). Larval feeding success, and thus development to the nymph stage, depends on the host differences in age, density, and life history (36).

The results showed statistically different numbers of tick collection among the months from January to June, for the seasonal occurrence of hard ticks. The abundance of ticks was affected by climatic factors, temperature, and humidity. In the summer months of the temperate zones, long periods of high temperature may promote a rise of the mortality rates of molting stages, but long winters may result big mortalities in the tick's population (37). In the effect of the climate on the tick abundance, two crucial factors are: composition and presence of the hosts (38). Human actions that changed and modified the habitats of the vectors and hosts, may have more profound effects on the epidemiology of tick than climate change (39). The complex ecosystems define the different epidemiological cycles of hard ticks, biotic and abiotic parameters affecting the formation and persistence of tick communities and their associated pathogens (40). Climate is essential in determining which tick species are found in a given geographic region, and their population density (41). Ticks are expected to respond to the changes in the weather variables. It has been predicted that the forecasted trends in weather will increase the range of ticks or their abundance in different ways (40).

Conclusion

The survey showed that goats infected with some species of hard ticks, and therefore can be transmitted to other economic and wild animals. The ixodid tick species differed according to the prevalence rate, average severity, and relative density. The range of ticks varied according to the different months of the year, and the seasonal presence of ticks increased in spring and summer compared to winter and autumn. The distribution of ticks was found at different binding sites on the body of goats.

Acknowledgment

The authors would like to extend they're thanks to all those who assisted in making this work possible, especially those who helped collect and diagnose samples and perform the statistical analysis.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

References

1. Nicholson WL, Sonenshine DE, Noden BH, Brown RN. Ticks (Ixodida). In: Mullen GR, Durden LA, editors. Medical and veterinary entomology. USA: Academic Pres; 2019. 603-672 pp. DOI: 10.1016/B978-0-12-814043-7.00027-3
2. Walker AR. Ticks of domestic animals in Africa: A guide to identification of species. UK: Bioscience Reports Edinburgh; 2013. 272 p. [available at]
3. Estrada-Peña A. Ticks as vectors: Taxonomy, biology and ecology. Rev Sci Tech. 2015;34:53-65. DOI: 10.20506/rst.34.1.2345
4. Wall RL, Shearer D. Veterinary ectoparasites: Biology, pathology and control. USA: John Wiley & Sons; 2008. 242 p. [available at]
5. Dhooria MS. Fundamentals of applied acarology. USA: Springer; 2016. 455 p. [available at]
6. Basu AK, Charles R. Ticks of Trinidad and Tobago-an overview. USA: Academic Press; 2017. 514 p.
7. Guglielmone AA, Robbins RG, Apanaskevich DA, Petney TN, Estrada-Peña A, Horak IG. The hard ticks of the world. Dordrecht: Springer; 2014. 315 p.
8. Aktas M, Altay K, Ozubek S, Dumanli N. A survey of ixodid ticks feeding on cattle and prevalence of tick-borne pathogens in the Black sea region of Turkey. Vet Parasitol. 2012;187(3-4):567-571. DOI: 10.1016/j.vetpar.2012.01.035
9. Samish M, Ginsberg H, Glazer I. Biological control of ticks. Parasitol. 2004;129:S389-S403. DOI: 10.1017/s0031182004005219
10. Hoogstraal H. African Ixodoidea: Ticks of the Sudan. USA: Biodiversity Library; 1956. 32 p. DOI: 10.5962/bhl.title.6870
11. Okello-Onen J, Hassan SM, Suliman E. Taxonomy of African ticks: An identification manual. International Centre of Insect Physiology and Ecology (ICIPE).1999;35p. [available at]
12. Faouzi M, Ahmed BN, Saida M. Inventory of ticks on dogs in rural areas of the northeast of Algeria and its relationship with influences some ecological and climatic parameters. Iraqi J Vet Sci. 2019;32(2):175-182. DOI: 10.33899/ijvs.2019.153846
13. Cary A. North Carolina. Statistical Software. JMP Version 7 SAS Institute, 2007.
14. Awad A, Abudl-Hussein M. Epidemiological study on the hard ticks of some domestic animals in Basrah. Basrah J Sci. 2005;23:93-108. [available at]
15. Hatem AN. Prevalence and ecology of the brown dog tick *Rhipicephalus sanguineus* in domestic mammals in Basrah province, Iraq, with the acaricidal effect of *Quercus brantti* acorns extract in adults. Iraqi J Agric Sci. 2020;51(6):1670-1677. DOI: 10.36103/ijas.v51i6.1195
16. Hatem AN, AL-Asadi SA, Hatem AN. Evaluation of toxicity of *Eucalyptus cammadelulensis* essential oil in the hard tick *Hyalomma anatolicum* (Acari: Ixodidae) infested livestock in Basrah province, Iraq. Ann Trop Med Public Health. 2020;23:231-379. DOI: 10.36295/asro.2020.231379
17. AL-Mayah SH. Abdul-Karim AT. Epidemiology and seasonal variation of Ixodid ticks and piroplasmida detection in cattle of Basrah province, Iraq. Indian J Forensic Med Toxicol. 2020;14(3):671. DOI: 10.37506/ijfmt.v14i3.10588
18. Hasson RH. Tick distribution and infestation among goats and cattle in Baghdad's south suburb. Kufa J Vet Med Sci. 2012;3(1):77-90. [available at]

19. Mohammad MK. Distribution of Ixodid ticks among domestic and wild animals in central Iraq. Bull Iraq Nat Hist Mus. 2015;13(3):23-30.[available at]
20. AL-Fatlawi MA, Ali M, Albayati H. Morphological and phylogenetic study of *Hyalomma anatolicum* in Al-Najaf, Iraq. Iraqi J Vet Sci. 2018;32:261-266. DOI: 10.33899/ijvs.2019.153860
21. Kadir MK, Zangana B, Mustafa A. A study on epidemiology of hard tick (Ixodidae) in sheep in Sulaimani governorate - Iraq. Iraqi J Vet Sci. 2012;26(III): 95-103. DOI: 10.33899/ijvs.2012.168745
22. AL-Lahaibi A, AL-Taee F. Detection of some species of lice and ticks infestation on local buffalo in Mosul city. Iraqi J Vet Sci. 2019;32(2):43-50. DOI: 10.33899/ijvs.2019.153876
23. Mustafa B. Detection on ectoparasites on small ruminants and their impact on the tanning industry in Sulaimani province. Iraqi J Vet Sci. 2019;33(2):303-309. DOI: 10.33899/ijvs.2019.162995
24. Ismael S, Omer L. Molecular identification of new circulating *Hyalomma asiaticum asiaticum* from sheep and goats in Duhok governorate, Iraq. Iraqi J Vet Sci. 2021;35(1):79-83. DOI: 10.33899/ijvs.2020.126330.1298
25. Abdullah S, Dyary H. Molecular characterization and phylogenic analysis of *Anaplasma spp.* in small ruminants from Sulaymaniyah governorate, Iraq. Iraqi J Vet Sci. 222;36(1):15-20. DOI: 10.33899/ijvs.2021.128475.1581
26. Mansoor J, Wisam R, Atiyah A, Al-Fatlawi A, Khlaif F. Genotypic analysis of ticks species infesting cattle in Al-Diwaniyah abattoir. Iraqi J Vet Sci. 2021;35(4):673-677. DOI: 10.33899/ijvs.2020.127772.1525
27. Bursali A, Keskin A, Tekin S. A review of the ticks (Acari: Ixodida) of Turkey: Species diversity, hosts and geographical distribution. Exp Appl Acarol. 2012;57(1):91-104. DOI: 10.1007/s10493-012-9530-4
28. Dantas-Torres F. Climate change, biodiversity, ticks and tick-borne diseases: the butterfly effect. Int J Parasitol Parasites Wildl. 2015;4(3):452-461. DOI: 10.1016/j.ijppaw.2015.07.001
29. Lubelczyk CB, Hanson T, Lacombe EH, Holman MS, Keirans JE. First US record of the hard tick Ixodes (Pholeoixodes) gregsoni Lindquist, Wu, and Redner. J Parasitol. 2007;93(3):718-720. DOI: 10.1645/GE-943R.1
30. Randolph S. Tick ecology: Processes and patterns behind the epidemiological risk posed by ixodid ticks as vectors. Parasitol. 2004;129(1):S37-S65. DOI: 10.1017/S0031182004004925
31. Bakirci S, Aysul N, Eren H, Unlu A, Karagenc T. Diversity of ticks biting humans in Aydın province of Turkey. Ank Univ Vet Fak Derg. 2014;61:93-98. [available at]
32. Muders SV. The role of European big game (*Capreolus capreolus* and *Sus scrofa*) as hosts for ticks and in the epidemiological life cycle of tick-borne diseases [Ph.D. dissertation]. Germany: The Karlsruhe Institute of Technology; 2015. 34 p.
33. Jones CR, Brunner JL, Scoles GA, Owen JP. Factors affecting larval tick feeding success: Host, density and time. Parasites Vectors. 2015;8(1):340. DOI: 10.1186/s13071-015-0955-6
34. Nelder MP, Russell CB, Clow KM, Johnson S, Weese JS, Cronin K, Patel SN. Occurrence and distribution of *Ambylomma americanum* as determined by passive surveillance in Ontario, Canada (1999-2016). Ticks Tick Borne Dis. 2019;10(1):146-155. DOI: 10.1016/j.ttbdis.2018.10.001
35. Pfäffle M, Littwin N, Muders SV, Petney TN. The ecology of tick-borne diseases. Int J Parasitol. 2013;43(12-13):1059-1077. DOI: 10.1016/j.ijpara.2013.06.009
36. Nava S, Venzal JM, Acuña DG, Martins TF, Guglielmone AA. Ticks of the southern cone of America: Diagnosis, distribution, and hosts with taxonomy, ecology and sanitary importance. USA: Academic Press; 2017. 122 p.
37. Wikel SK. Ticks and tick-borne infections: Complex ecology, agents, and host interactions. Vet Sci. 2018;5(2):60. DOI: 10.3390/vetsci5020060
38. Léger E, Vourc'h G, Vial L, Chevillon C McCoy KD. Changing distributions of ticks: Causes and consequences. Exp Appl Acarol. 2013;59(1):219-244. DOI: 10.1007/s10493-012-9615-0
39. Estrada-Peña A, de la Fuente J. The ecology of ticks and epidemiology of tick-borne viral diseases. Antiviral Res. 2014;108:104-128. DOI: 10.1016/j.antiviral.2014.05.016
40. Estrada-Peña A, Gray JS, Kahl O, Lane RS, Nijhof AM. Research on the ecology of ticks and tick-borne pathogens-methodological principles and caveats. Front Cell Infect Microbiol. 2013;3:29. DOI: 10.3389/fcimb
41. Lebert I, Agoulon A, Bastian S, Butet A, Cargnelutti B, Cèbe N, Plantard O. Distribution of ticks, tick-borne pathogens and the associated local environmental factors including small mammals and livestock, in two French agricultural sites: The OSCAR database. Biodiversity Data J. 2020;8. DOI: 10.3897/BDJ.8.e50123

مقاييس التطفل للقراد الصلب المصيب للماعز في محافظة البصرة، العراق مع ملاحظات على البيئة

علاء ناظم حاتم[١] و أشواق طالب عبد الكريم[٢]

[١]فرع علوم الحياة، كلية التربية للعلوم الصرفة، جامعة البصرة، [٢]مديرية التربية في محافظة البصرة، البصرة، العراق

الخلاصة

يعد الماعز من الحيوانات الاقتصادية المهمة في العالم وخاصة في العراق، تتطفل العديد من أنواع القراد على الماعز مسببة بعض الأمراض المهمة حول العالم، صُممت الدراسة بإجمالي ٢٤٠ رأسًا من الماعز في محافظة البصرة ، جنوب العراق ، في الفترة من كانون الثاني إلى حزيران ٢٠٢١، وقد سجلت أصابة ما مجموعه ١١٠ من ٢٤٠ من الماعز (٤٥,٨٣٪) بالقراد الصلب، تم إجراء التشخيص من خلال العديد من الصفات المظهرية للقراد وتم تسجيل ستة أنواع وهي: *Hyalomma anatolicum* و *Hyalomma exacavatum* و *Hyalomma dromedarii* و *Hyalomma scupense* و *Rhipicephalus sanguineus* و *Rhipicephalus turanicus* . تم تسجيل النوع *H. scupense* في جنوب العراق لأول مرة كذلك سجلت الماعز كمضيف جديد جديدة للنوع *H. dromedarii* في العراق. سجل النوع *H. anatolicum* أعلى معدلات الانتشار ومتوسط شدة الإصابة والكثافة النسبية، بينما كان النوع *H. dromedarii* هو الأقل. كان عدد الإناث التي تم جمعها من القراد أعلى من عدد الذكور؛ كان العدد الإجمالي للإناث الماصة للدم هو الأعلى، بينما كانت اليرقات هي الأقل. تراوح نمط الإصابة المتزامنة في الماعز بأنواع القراد بين الإصابة المفردة والرباعية. تم عزل أكبر عدد من القراد من الوجه والأذن والضرع والذيل والخصيتين والفخذين والإبط على جسم الماعز المصاب.