Frontiers in Health Informatics
ISSN-Online: 2676-7104
www.healthinformaticsjournal.com
2024; Vol 13: Issue 3
Open Access

Diagnostic study of *Hyalomma* ticks species parasitic on cows, buffaloes and camels in Dhi Qar governorate/ Iraq

Hind Abdulzahra Abdulkadhim Alshaibani[1], Abdul–Jaleel Aziz Karim Alqaraghli[2], Hadi M. Hamza Al-Mayali[1]

[1]Department of Biology, College of Education, University of Al-Qadisiyah, Iraq
[2]Directorate of Education Dhi Qar, Ministry of Education, Iraq
Mtqr86@gmail.com,hind.alshabiny@qu.edu.iq,hadi.hamza@qu.edu.iq

Cite this paper as: Hind Abdulzahra Abdulkadhim Alshaibani, Abdul–Jaleel Aziz Karim Alqaraghli, Hadi M. Hamza Al-Mayali (2024) Diagnostic study of Hyalomma ticks species parasitic on cows, buffaloes and camels in Dhi Qar governorate/ Iraq. *Frontiers in Health Informatics, 13* (3), 1645-1653.

Abstract

Ticks rank second after mosquitoes as carriers of diseases that affect humans and animals, the most important of which are the Crimean Congo Haemorrhagic Fever (CCHF) virus in humans, and Theileria annulata in animals.

This study identified five species of ticks of the genus Hyalomma in some areas of Dhi Qar governorate in southern Iraq, which is characterized by the presence of large areas of marshes in which migratory birds abound, which may be the cause of the transmission of these species of ticks and thus the transmission of CCHF that has spread in this province. In the last years

Samples were collected from 100 cows, 80 buffaloes and 40 camels infected with Hyalomma. Three species were recorded in cattle: H. anatolicum (65%), H. excavatum (43%) and H. scupense (10%), and two species in buffalo: H. impeltatum and H. rufipes by 62.5% and 41.25%, respectively. In camels, H. anatolicum (80%) and H. impeltatum (47.5%) were recorded. It was also found that H. anatolicum infects both cattle and camels (mixed infestations), while H. impeltatum is shared between buffalo and camels.

Keywords*: Hyalomma, hard ticks, Diagnostic study*

Introduction

About 900 species of ticks are spread throughout the world [1], and they are the main carrier of pathogenic microorganisms for animals and humans in the Northern Hemisphere, and they are also the main carrier of pathogenic microorganisms for animals in the Southern Hemisphere [2].

Ticks are important ectoparasites, that parasitize birds, reptiles, and mammals in particular, so they are of great medical and veterinary importance [3], and transmit types of bacteria, protozoa, rickettsia, and viruses that infect humans and animals and cause a number of diseases [5 ,4]. In North Africa, ticks are one of the most harmful pests and a powerful vector of many of these diseases [6].

There is great medical and veterinary importance for tick species of the genus *Hyalomma* in tropical and subtropical regions [7]. *Hyalomma* species are distributed on the continents of Asia, Africa, and Europe [8].

There are 27 species of *Hyalomma* [9], five of which are distributed on three continents, another seven recorded in Asia, nine in Africa and Asia and one species in Africa and Europe. About 50% of these species transmit many diseases, the most important of which is the Crimean Congo Haemorrhagic Fever (CCHF) virus in humans [11 ,10]. and *Theileria annulata* in animals [12].

The genus *Hyalomma* has three life cycle stages: larvae, nymphs and adults, each stage requiring only one blood meal. Adults usually feed on large vertebrate animals, especially livestock, while larvae and nymphs prefer small animals in hidden places [15-13].

The tick remains on the same host for two to five weeks [16]. In this way, this tick can infect birds migrating from Africa or southern Europe, arriving in northern Europe after several days or a few weeks. This phenomenon has been documented by several authors [20-17].

In recent years, many cases of infection with CCHF disease, which is transmitted by the genus *Hyalomma*, have been recorded, especially in Dhi Qar governorate in southern Iraq, where marshes abound and where migratory birds spread. The possibility of this disease spreading to other countries through migratory birds that carry this disease has been reported. The type of tick is very high

Materials and Methods

Study area and Specimens collection

Samples for the current study were collected from some areas of Dhi Qar governorate where cows and buffalo are raised (the countryside and marshes) and those where camels are raised (the desert). These areas include: Al-Nasr, Al-Shatra, Al-Nasiriyah, Al-Tar, and Al-Chibayish

The ticks were removed from the skin of different parts of the bodies of the infected animals by wiping the affected area with cotton moistened with ethyl alcohol and then removing them with forceps. The ticks were placed in small bottles containing 70% ethanol, after which they were transferred to the Iraq Natural History Research Center and Museum "INHM" at the University of Baghdad for the purpose of diagnosis and classification.

The tick in the "INHM" was treated with a 10% potassium hydroxide (KOH) solution to obtain transparency [21]; The samples were identified through taxonomic references [23 ,22] .

Results & Discussion

Samples were collected from 100 cows, 80 buffalo and 40 camels infected with *Hyalomma* hard ticks. Three species were diagnosed in cows: *H. anatolicum* (65%), *H. excavatum* (43%), and *H. scupense* (10%), and two species in buffalo: *H. impeltatum* and *H. rufipes* by 62.5% and 41.25%, respectively.

In camels, *H. anatolicum* (80%) and *H. impeltatum* (47.5%) were diagnosed. It was also found that *H. anatolicum* infects both cattle and camels (mixed infestations), while *H. impeltatum* is shared between buffalo and camels. Table (1) below shows this.

Table (1): *Hyalomma* species isolated from infected animals in Dhi Qar governorate/Iraq

Animals	*Hyalomma* spp.	Total number of animals	No. of infested specimens	%
Cows	*H. anatolicum*	100	65	65
	H. excavatum		43	43
	H. scupense		10	10
Buffalo	*H. impeltatum*	80	50	62.5
	H. rufipes		33	41.25
Camels	*H. anatolicum*	40	32	80
	H. impeltatum		19	47.5

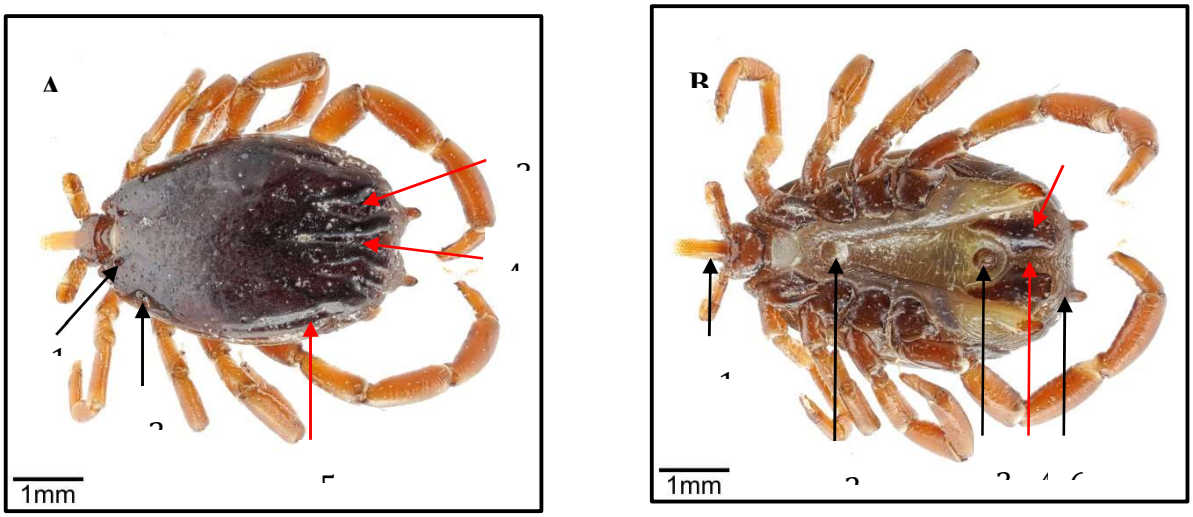

Figure 1: *H. anatolicum* male: (A) Dorsal surface: 1. Porose area 2. Eye 3 . Paramedian groove 4. Posterior groove 5. Lateral groove (B)Ventral surface: 1. mouth parts 2. genital aperture 3. Anus 4. Anal groove 5. Adanal shields 6. Sub-anal shields.

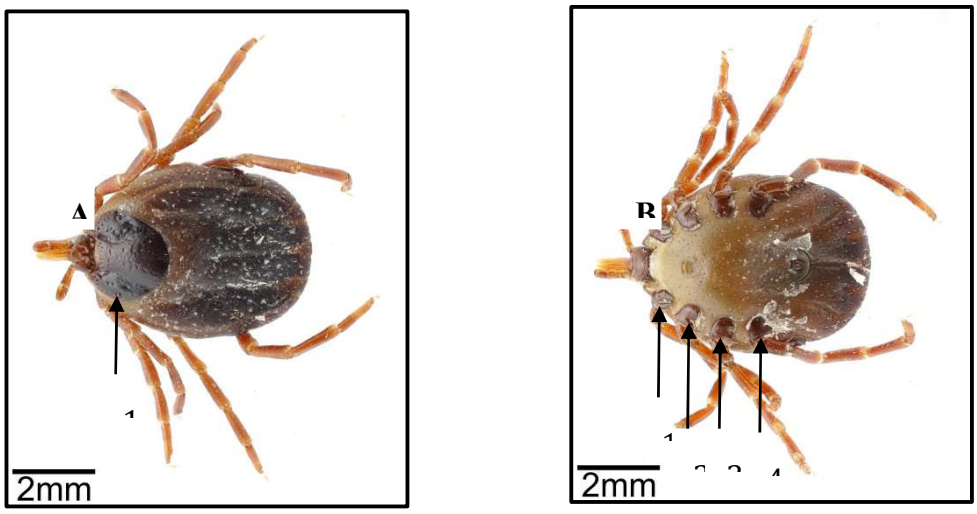

Figure 2: *H. excavatum* male: (A) Dorsal surface: 1. Eye (B)Ventral surface: 1. Coxa I 2. Coxa II 3. Coxa III 4. Coxa IV

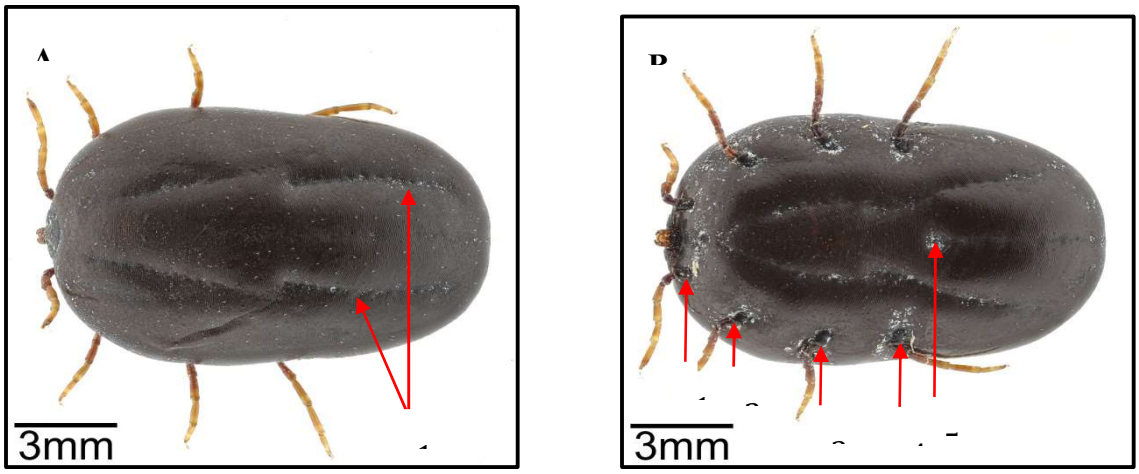

Figure 3: *H. scupense* male: (A) Dorsal surface: 1. Paramedian groove (B)Ventral surface: 1. Coxa I 2. Coxa II 3. Coxa III 4. Coxa IV 5. Anus

Figure 4: *H. impeltatum* male: (A) Dorsal surface: 1. Eye (B)Ventral surface: 1. Anus 2. genital aperture

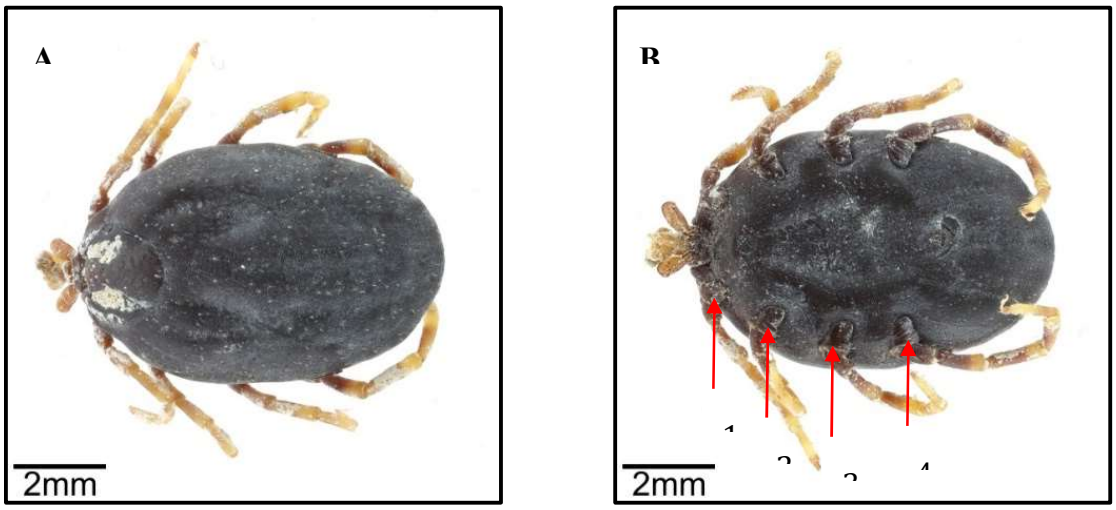

Figure 4: *H. rufipes* male: (A) Dorsal surface: (B)Ventral surface: 1. Coxa I 2. Coxa II 3. Coxa III 4. Coxa IV

Interest in *Hyalomma* ticks has increased due to their role in transmitting CCHF virus to humans, especially in central and southern Iraq, where dozens of cases have been recorded in Thi Qar Governorate/southern Iraq, as well as other central and southern governorates. It has been experimentally found that there is a close association between CCHFv infection through the bite of infected ticks of the species *H. dromedarii*, *H. impeltatum*, *H. marginatum*, *H. rufipes*, and *H. truncatum* [24].

In this study, five species of ticks from the genus *Hyalomma* were detected: *H. anatolicum, H. excavatum, H. scupense, H. impeltatum* and *H. rufipes.* This study agrees with the study of Mustafa *et al.* (2019) which recorded H. scupense, H. turanicum and H. anatolicum in Samarra[24-30].

It also agrees with the study of Makawi and Hadi (2023) that recorded eight species *H. truncatum, H. excavatum, H. anatolicum, H. marginatum, H. impeltatum, H. rufipes, H. scupense* and *H. dromedarii* in central and southern Iraq [25].

The spread of *Hyalomma* may be due to its ability to withstand environments with low humidity and difficult climatic conditions [26]. This study also found mixed infections of ticks on a single host, which is consistent with the study of Ahmad *et al.* (2021) as well as the study of Makawi and Hadi (2023) who reached the same results [25,41-46]

References

1 De la Fuente, J., et al., Tick-pathogen interactions and vector competence: identification of molecular drivers for tick-borne diseases. 2017. 7: p. 114.

.2 Eisen, R.J. and L.J.T.i.p. Eisen, The blacklegged tick, Ixodes scapularis: an increasing public health concern. 2018. 34(4): p. 295-309.

.3 Mehlhorn, H., Encyclopedic reference of parasitology. Berlin, Germany, Springer, 2004.

.4 Akhtar, M., et al., Immunity against Ticks-A Review. 2011. 31.**(1)**

.5 Ullah, Z., et al., Poaching of Asiatic black bear: evidence from Siran and Kaghan valleys, Pakistan. 2020. 24: p. e01351.

.6 Karesh, W.B., et al., Wildlife trade and global disease emergence. 2005. 11(7): p. 1000.

.7 Mehlhorn, H., Arthropods as vectors of emerging diseases. Vol. 3. 2012: Springer Science & Business Media.

.8 Sands, A.F., et al., Effects of tectonics and large scale climatic changes on the evolutionary history of Hyalomma ticks. 2017. 114: p. 153-165.

.9 Guglielmone, A.A., et al., The Argasidae, Ixodidae and Nuttalliellidae (Acari: Ixodida) of the world: a list of valid species names. Zootaxa, 2010. 2528: p. 1–28.

.10 Aktas, M., Z. Vatansever, and S. Ozubek, Molecular evidence for trans-stadial and transovarial transmission of Babesia occultans in Hyalomma marginatum and Rhipicephalus turanicus in Turkey. Vet. Parasitol, 2014. 204(3-4): p. 369-371.

.11 Hornok, S. and G. Horváth, First report of adult Hyalomma marginatum rufipes (vector of Crimean-Congo haemorrhagic fever virus) on cattle under a continental climate in Hungary. Parasites vectors, 2012. 5: p. 1-4.

.12 Kumar, B., H.V. Manjunathachar, and S.J.H. Ghosh, A review on Hyalomma species infestations on human and animals and progress on management strategies. 2020. 6.**(12)**

.13 Kar, S., et al., Crimean-Congo hemorrhagic fever virus in tortoises and Hyalomma aegyptium ticks in East Thrace, Turkey: potential of a cryptic transmission cycle. 2020. 13: p. 1-13.

.14 Madison-Antenucci, S., et al., Emerging tick-borne diseases. 2020. 33(2): p. 10.1128/cmr. 00083-18.

.15 Sonenshine, D.E.J.I.j.o.e.r. and p. health, Range expansion of tick disease vectors in North America: implications for spread of tick-borne disease. 2018. 15(3): p. 478.

.16 Balashov, Y.S., Bloodsucking ticks (Ixodoidea)—vectors of diseases of man and animals, in Bloodsucking Ticks (Ixodoidea)—Vectors of Diseases of Man and Animals. 1972, BioOne. p. 167.

.17 Nuorteva, P. and H. Hoogstraal, The incidence of ticks (Ixodoidea, Ixodidae) on migratory birds arriving in finland during the spring of 1962. Ann. Med. Exper. et Biol. Fenniae, 1963. 41(4): p. 457-68.

.18 Jaenson, T.G., et al., Geographical distribution, host associations, and vector roles of ticks (Acari: Ixodidae, Argasidae) in Sweden. Journal of Medical Entomology, 1994. 31(2): p. 240-256**.**

.19 Hasle, G., Transport of ixodid ticks and tick-borne pathogens by migratory birds. Frontiers in cellular infection microbiology, 2013. 3: p. 48**.**

.20 Labbé Sandelin, L., et al., Candidatus Neoehrlichia mikurensis in ticks from migrating birds in Sweden. PloS one, 2015. 10(7): p. e0133250**.**

.21 Soulsby, E.J.L.J.H., arthropods and p.o.d. animals., Helminths, arthropods and protozoa of domesticated animals. 1968**.**

.22 Mohammad, M.J.P.D.T., A bio-taxonomic study on the hard ticks (Acari: Ixodidae) of some domestic and wild animal from Iraq. 1996, College of Sciences, University of Baghdad Baghdad, Iraq**.**

.23 Walker, A.R., Ticks of domestic animals in Africa: a guide to identification of species. Vol. 74. 2003: Bioscience Reports Edinburgh**.**

.24 Bonnet, S.I., et al., An update of evidence for pathogen transmission by ticks of the genus Hyalomma. 2023. 12(4): p. 513**.**

.25 Makawi, Z.A. and A.M.J.B.o.t.I.N.H.M. Hadi, Identification Of Hard Ticks From Buffalo Bubalus Bubalis (Linnaeus, 1758) In Iraq. 2023. 17(3): p. 423-434**.**

.26 Mullen, G.R. and L.A. Durden, Medical and veterinary entomology. 2009: Academic press**.**

.28MARGIANA, Ria, et al. Functions and therapeutic interventions of non-coding RNAs associated with TLR signaling pathway in atherosclerosis. Cellular Signalling, 2022, 100: 110471**.**

.29ARIF, Anam, et al. The functions and molecular mechanisms of Tribbles homolog 3 (TRIB3) implicated in the pathophysiology of cancer. International Immunopharmacology, 2023, 114: 109581**.**

.30LEI, Zimeng, et al. Detection of abemaciclib, an anti-breast cancer agent, using a new electrochemical DNA biosensor. Frontiers in Chemistry, 2022, 10: 980162**.**

.31BASHAR, Bashar S., et al. Application of novel Fe3O4/Zn-metal organic framework magnetic nanostructures as an antimicrobial agent and magnetic nanocatalyst in the synthesis of heterocyclic compounds. Frontiers in Chemistry, 2022, 10: 1014731**.**

.32LAFTA, Holya A., et al. Tumor-Associated Macrophages (TAMs) in Cancer Resistance; Modula-tion by Natural Products. Current topics in medicinal chemistry, 2023**.**

.33M ABBAS, Mahmoud, et al. Effects of various irrigation levels and biochar-based fertilizers on peanut production. Journal of Nuts, 2022, 13.4: 289-300**.**

.34HUSSEIN, Hanna Abdulkareem, et al. Impact of pollution caused by salmon breeding centers on river water quality. Caspian Journal of Environmental Sciences, 2022, 20.5: 1039-1045**.**

.35HJAZI, Ahmed, et al. The pathological role of CXC chemokine receptor type 4 (CXCR4) in colorectal cancer (CRC) progression; special focus on molecular mechanisms and possible therapeutics. Pathology-Research and Practice, 2023, 154616**.**

.36ANAZI, Abeer Abdullah Al, et al. Investigation and evaluation of the hybrid system of energy storage for renewable energies. Energies, 2023, 16.5: 2337**.**

.37ALTHOMALI, Raed H., et al. A novel Pt-free counter electrode based on MoSe2 for cost effective dye-sensitized solar cells (DSSCs): Effect of Ni doping. Journal of Physics and Chemistry of Solids, 2023, 182: 111597**.**

.38HJAZI, Ahmed, et al. Unraveling the Impact of 27-Hydroxycholesterol in Autoimmune Diseases: Exploring Promising Therapeutic Approaches. Pathology-Research and Practice, 2023, 154737**.**

.39GUPTA, Jitendra, et al. Double-edged sword role of miRNA-633 and miRNA-181 in human cancers. Pathology-Research and Practice, 2023, 154701**.**

.40SANE, Shahryar, et al. Investigating the effect of pregabalin on postoperative pain in non-emergency craniotomy. Clinical Neurology and Neurosurgery, 2023, 226: 107599**.**

.41AL-JASSANI, Mohammad J., et al. Isolation and Evaluation of Antibacterial Agents Produced by Soil Bacillus SP. and Study Some of their Immunological Parameters. Revista Electronica de Veterinaria, 2022, 23.4: 105-111**.**

.42 Langzhun Ze, F. Al-dolaimy, S. Mohammad Sajadi, et al., The effect of number of nanoparticles on atomic behavior and aggregation of CuO/water nanofluid flow in microchannels using molecular dynamics simulation, Engineering Science and Technology, an International Journal, Volume 47,2023, 101556, ISSN 2215-0986, https://doi.org/10.1016/j.jestch.2023.101556**.**

.43 Al-dolaimy, F., Kzar, M.H., Hussein, S.A. et al. Incorporating of Cobalt into UiO-67 Metal–Organic Framework for Catalysis CO2 Transformations: An Efficient Bi-functional Approach for CO2 Insertion and Photocatalytic Reduction. J Inorg Organomet Polym (2023). https://doi.org/10.1007/s10904-023-02860-0

.44AL-HAWARY, S. I. S., et al. Tunneling induced swapping of orbital angular momentum in a quantum dot molecule. Laser Physics, 2023, 33.9: 096001**.**

.45 Gaffar Sarwar Zaman, Ibrahem Waleed, et al., Electrochemical determination of zearalenone in agricultural food samples using a flower like nanocomposite-modified electrode, Materials Chemistry and Physics, Volume 305, 2023, 127986, ISSN 0254-0584, https://doi.org/10.1016/j.matchemphys.2023.127986**.**

.46 Muzammil Khursheed, Kzar Mazin Hadi, Mohammed Faraj, et al., Methanol extract of Iraqi Kurdistan Region Daphne mucronata as a potent source of antioxidant, antimicrobial, and anticancer agents for the synthesis of novel and bioactive polyvinylpyrrolidone nanofibers. JOURNAL=Frontiers in Chemistry. 2023,Vol. 11, ISSN=2296-2646. DOI=10.3389/fchem.2023.1287870