



Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Biomedicine

journal homepage: www.elsevier.com/locate/apjtb



Document heading

doi:10.1016/S2221-1691(14)60233-1

© 2014 by Asian Pacific Journal of Tropical Biomedicine. All rights reserved.

Survey on cattle ticks in Nur, north of Iran

Ashkan Ghasemi Moghaddam¹, Mozafar Razavi Seyed¹, Mehrshad Rasouli¹, Sajad Hosseinzade¹, Mohammad Mehdi Darvishi², Arash Rakhshanpour³, Mohammad Taghi Rahimi^{4,5*}

¹Young Researchers Club, Islamic Azad University, Babol Branch, Iran

²Department of Veterinary Parasitology, Semnan University, Semnan, Iran

³Department of Medical Parasitology and Mycology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

⁴Department of Parasitology and Mycology, School of Medicine, Mazandaran University of Medical Science, Sari, Iran

⁵Young Researchers Club, Islamic Azad University, Babol Branch, Iran

PEER REVIEW

Peer reviewer

Mohammad Reza Youssefi, Assistant Professor, Department of Veterinary Parasitology, Islamic Azad University, Bbabol–Branch.

Tel: +9811148631

E-mail: youssefi929@hotmail.com

Comments

This is a good study in which the authors surveyed ticks of cattle in Nur County.

The results are valuable as there is not published data regarding ticks of livestock animals in this area. In addition, the probable dangers of the causative agent of disease which are transmitted by the isolated ticks were highlighted properly.

Details on Page 211

ABSTRACT

Objective: To survey the prevalence of cattle ticks in Nur County and prepare a list of tick fauna in this district.

Methods: This investigation was carried out on 150 head of cattle ticks of rural areas of Nur city which is located in Mazandaran province during spring and summer seasons of 2011. The collected ticks were identified using light microscope and available systematic keys.

Results: A total number of 1563 ticks were isolated from examined cattle and their genus and numbers including: *Ixodes ricinus* 51% (111 male and 691 female) and *Boophilus annulatus* 49% (83 male and 678 female), respectively.

Conclusions: Results of the current investigation indicate the presence of two species of acarine ectoparasites which have potential health risk *Ixodes ricinus* and *Boophilus annulatus*. More studies are required to increase our data concerning ticks and other ectoparasites of ruminants in other areas of Mazandaran province and should be noted to their ability in transmission of infectious agents.

KEYWORDS

Acarine ectoparasites, Tick, Livestock, Cattle, Public health risk, Iran

1. Introduction

Ticks (Arachnida: Acari: Parasitiformes) are hematophagous arthropods and obligatory ectoparasites which are considered significant in both veterinary and medical field by acting as vector of serious pathogens such as *Babesia*, *Thileria*, *Rickettsia*, *Anaplasma* spp. and *Borrelia*. When these obligatory ectoparasites attach to a host for the aim of blood sucking, they induce skin

irritation and anemia. Moreover, ticks are responsible for serious economic losses of animal owners particularly in livestock industries^[1,2]. Ticks are classified into two major families, Ixodidae (hard ticks) and Argasidae (soft tick). The family Ixodidae comprises nearly 700 species including two major morphological and phylogenetic groups which are the Metastrata and the Prostrata. They have ability of infesting a wide variety of hosts such as mammals, birds, reptiles and amphibians. In addition, hard ticks are distributed broadly

*Corresponding author: Mohammad Taghi Rahimi, Department of Parasitology and Mycology, School of Medicine, Mazandaran University of Medical Science, Sari, Iran and Young Researchers Club, Islamic Azad University, Babol Branch, Iran.

Tel: +989122930625.

E-mail: rahimint@gmail.com

Foundation Project: Supported by the Young Researchers Club, Islamic Azad University, Babol Branch (Grant No. BPJ1391).

Article history:

Received 19 Dec 2013

Received in revised form 22 Dec, 2nd revised form 30 Dec, 3rd revised form 10 Jan 2014

Accepted 25 Feb 2014

Available online 28 Mar 2014

throughout the world[3,4].

The prevalence of the tick species which are involved on the transmission and their geographical distribution for the purpose of control and tick borne diseases are a matter of high importance. Although Nur County has considerable superficial water resources which prepare an ideal area for agriculture and animal husbandry, there is not enough information concerning tick fauna of different hosts in this district. Therefore, the current investigation was conducted to survey the prevalence of cattle ticks in Nur County and prepare a list of tick fauna in this district.

2. Materials and methods

2.1. Study area

Nur County ($36^{\circ}34'25''\text{N}$, $52^{\circ}40' 52^{\circ}00'50''\text{E}$) (2675.00 km^2) is located on the Caspian Sea coast and belongs to Mazandaran province. This area embraces abundant superficial water resources which is proper for agriculture and animal husbandry. This district contains pastures and forests which are favorable for cattle grazing (Figure 1).



Figure 1. Map of Iran, highlighting the position of Nur County in Mazandaran province.

2.2. Tick collection

An investigation was carried out on ticks of 150 heads of cattle from 25 herds of 11 villages during the hot and humid months (the spring and summer) of 2011 from rural areas of Nur County, Mazandaran province, Iran. Tick sampling was undertaken on all body of each animal at different intervals.

Thereafter, isolated ticks were counted and separately stored in 70% ethanol, labeled with the date until the species determination. Afterwards, all of crucial characters of tick samples were studied precisely. Their identification was undertaken based on taxonomic and structural differences of the species by means of stereoscope (Nikon SMZ1500) and light microscope (Nikon. Microphoy–FXA) which was equipped by camera (Memmert D–91126) according to available systematic keys[5–7].

3. Results

During the study, among 11 villages, a total number of 1563 ticks were isolated from 150 examined cattle from 25 herds. The mean intensity for each animal was 10.42. Two tick genera and species were observed and recognized during the study including: *Ixodes ricinus* (*I. ricinus*) 802 (51%) (111 male, 691 female) and *Boophilus annulatus* (*B. annulatus*) 761 (49%) (51 male and 710 female) (Figures 2 and 3). Totally 1401 female and 162 male ticks were extracted from examined cattle. Moreover, no soft tick (Argasidae family) was observed.



Figure 2. Extracted tick (*I. ricinus*) from cattle.

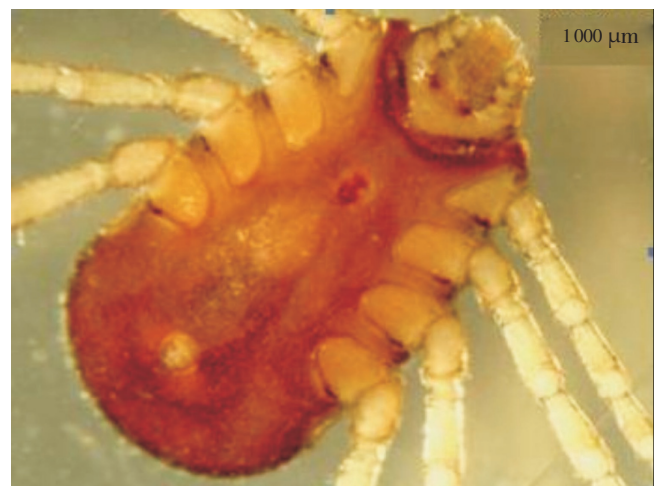


Figure 3. Extracted tick (*B. annulatus*) from cattle.

4. Discussion

In the present investigation, two tick genera and species from Ixodidae family were found, including *I. ricinus* (51%) and *B. annulatus* (49%). In addition, the number of female ticks was noticeably higher than male. Species of *Ixodes* are vectors of major diseases such as Lyme disease, caused by the spirochaete *Borrelia burgdorferi*, human granulocytic ehrlichiosis, Rocky Mountain spotted fever tick paralysis, Powassan encephalitis virus and babesiosis[8,9].

In addition, *B. annulatus* belongs to subfamily Rhipicephalinae. They are all one–host ticks. All stages including larval, nymphal, and adult spend on the same host and this is a rare features among ticks. Species of *Boophilus* are vectors of Crimean–Congo hemorrhagic fever, ganjon viruses, bhanja virus in Nigeria and Thogoto virus in Kenya. Moreover, rickettsia *Anaplasma marginale* is carried to cattle by all three species of *Boophilus* in Africa. By far, the most important disease transmitted by a species of *Boophilus* is Texas cattle fever, also called red–water fever. The agent of this disease is a piroplasm, *B. bigemina*[10].

In the United States in 1906, *B. bigemina* transmitted by *Boophilus* and it caused annual losses of 100 million dollars[11]. In Tanzania, the annual cost of diseases which was estimated by ticks was computed at 364 million dollars[12]. Estimations of total economic impact of tick parasitism is not easy precisely due to many contributing factors, including reduction of weight gaining, decrease of milk production, expense of tick control, nutritional state and breed of cattle.

According to literature review, Shemshad *et al.* introduced the following tick fauna from cattle, sheep and goats in Boen Zahra County: *Haemaphysalis concinna* (0.63%), *Haemaphysalis sulcata* (12.66%), *Hyalomma anatolicum* (*Hy. anatolicum*) (3.80%), *Hyalomma asiaticum* (*Hy. asiaticum*) (3.16%), *Hyalomma detritum* (*Hy. detritum*) (5.70%), *Hyalomma dromedarii* (28.48%), *Hyalomma marginatum* (*Hy. marginatum*) (13.29%), *Hyalomma schulzei* (1.89%), *Rhipicephalus bursa* (*Rh. bursa*) (3.16%) and *Rhipicephalus sanguineus* (*R. sanguineus*) (3.16%), and for Takistan's livestock were *Hyalomma dromedarii* (9.86%), *Hy. marginatum* (13.29%), *Hyalomma schulzei* (1.89%) and *R. sanguineus* (3.16%), respectively[13].

In Kelardasht (Chalous area), *Ixodes*, *Boophilus*, *Dermacentor*, *Haemaphysalis*, *Hyaloma* and *Rhipicephalus* were reported from cattle and sheep that *I. ricinus* (26.8%) was the most dominant tick species which was followed by *B. annulatus* (20.5%) in which our results are in agreement to their finding[14]. The occurrence of ticks on cattle in Ghaemshahr County, Mazandaran was reported 20.0% and *R. sanguineus* were the most abundant species in the study area[15].

In another investigation during 2004–2005, the following species were identified from cattle of eastern and western areas in Mazandaran province: *B. annulatus* (51.3%), *Rh. bursa* (16.8%), *Haemaphysalis punctata* (6.3%), *I. ricinus* (6.8%),

Hy. marginatum (12.5%), *Hy. anatolicum excavatum* (5.2%), *Hy. asiaticum* (0.6%), *Hy. detritum* (0.2%), and *Dermacentor* spp. (0.1%) and *B. annulatus* and *Rh. bursa* were the most prevalent tick species[16].

The following 15 ixodid tick species were recognized over the survey period from cattle, sheep and goats in Zagros mountainous areas: *Boophilus kohlsi* (3.6%) *R. sanguineus* (4.5%), *Rh. bursa* (21.9%), *Rhipicephalus turanicus* (2.9%), *Dermacentor niveus* (12.9%), *Dermacentor raskemensis* (4.1%), *Dermacentor marginatus* (7.3%), *Haemaphysalis punctata* (3.5%), *Hyalomma parva* (0.6%), *Hyalomma choldokovskyi* (2.0%), *Hy. anatolicum excavatum* (4.8%), *Hy. anatolicum anatolicum* (5.2%), *Hy. asiaticum asiaticum* (7.3%), *Hy. marginatum marginatum* (13.0%), and *Hy. detritum detritum* (5.9%)[17]. In an investigation in Savajbolgh, *Rhipicephalus* and *Hyalomma* were the most obtained ticks[18]. In another similar study in Kerman, prevailing species was *Hyalomma* in examined cattles[19].

The authors draw a conclusion based on the results of current investigation that there is a probable risk of disease which is transmitted by *I. ricinus* and *B. annulatus*. Therefore, continuous parasitological studies and control programs are greatly required in order to decrease the spread of tick infestation in these areas. As tick dispersal may occur all the time owing to tick hosts movement and climate change. The domestic ruminant infestation must not be neglected and must be taken serious because of two and three host ticks. And this important fact demonstrates their prominent role in transmitting and spreading several dangerous diseases both in humans and animals. In addition, further researches are required due to considerable unexplored area of our country in order to increase our knowledge about tick and ectoparasites of livestock and their infestations and probable zoonoses diseases in Iran.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

We wish to express our sincere thanks to Mr. Soleymani for his kind collaboration and assistance and also his valuable consultation during survey. This work was supported by the Young Researchers Club, Islamic Azad University, Babol Branch (Grant No. BPJ1391).

Comments

Background

Ectoparasites play a major role in transmission of disease to livestock. Annually they impose a considerable burden on livestock industries. Moreover, we cannot ignore their

importance as carrier of zoonose disease to human.

I think, the background of the study contains important aspects of ticks both in medical and veterinary fields.

Research frontiers

Survey on ectoparasite, particularly ticks of livestock which are usually in close contact with human, is of critical importance to economic and human health. As control of ectoparasites population is not easy, it requires a great amount of budget, energy and time.

Related reports

In Kelardasht (Chalous area), the most dominant tick was reported *I. ricinus* (26.8%) that is in agreement with the results of this research, although variety of their tick species were different. Shemshad *et al.* reported *Hy. dromedarii* as a the most dominant tick (28.48%) in Boeen Zahra County. This contrast is probably due to different geographical and climate condition.

Innovations and breakthroughs

Generally, preparing data from an area where there is not any information is a good idea. Besides, introduction of two ticks which are considered as a serious danger not only for human but also for livestock industry is valuable.

Applications

This is noteworthy to know the prevalence and mean intensity of tick in this area because we can estimate the economic impact of tick parasitism in livestock and also we are able to design a control program in order to prevent of probable zoonose disease and economical losses.

Peer review

This is a good study in which the authors surveyed ticks of cattle in Nur County. The results are valuable as there is not published data regarding ticks of livestock animals in this area. In addition, the probable dangers of the causative agent of disease which are transmitted by the isolated ticks were highlighted properly.

References

- [1] Wall R, Shearer D. *Veterinary ectoparasites: biology, pathology and control*. 2nd ed. Oxford: Blackwell Science; 2001, p. 1–2, 27–31, 66, 76, 80–81, 149–150, 166–167, 172–177, 179–181.
- [2] Shemshad K, Rafinejad J, Kamali K, Piazak N, Sedaghat MM, Shemshad M, et al. Species diversity and geographic distribution of hard ticks (Acari: Ixodoidea: Ixodidae) infesting domestic ruminants, in Qazvin Province, Iran. *Parasitol Res* 2011; **110**(1): 373–380.
- [3] Service MW. *Lecture notes on medical entomology*. Oxford: Black Well Scientific Publication; 1986, p. 338.
- [4] Larry SR, Janovy J. *Foundations of parasitology*. 7th ed. New York: Mcm Graw Hill; 2006; p. 570.
- [5] Estrada–Pena A, Bouattour A, Camicas JL, Walker AR. Ticks of domestic animals in Mediterranean Region: a guide to identification of species. Zaragoza: University of Zaragoza; 2004, p. 43–131.
- [6] Keirans JE, Litwaki TR. Pictorial key to the adults of hard ticks, family Ixodidae (Ixodida: Ixodoidea), east of the Mississippi River. *J Med Entomol* 1989; **26**(5): 435–448.
- [7] Walker AR, Bouattour A, Camicas JL, Estrada–Pena A, Horak IG, Latif A, et al. Ticks of domestic animals in Africa: a guide to identification of species. London: Bioscience Reports; 2003, p. 74–221.
- [8] Ramesh G, Borda JT, Dufour J, Kaushal D, Ramamoorthy R, Lackner AA, et al. Interaction of the Lyme disease spirochete *Borrelia burgdorferi* with brain parenchyma elicits inflammatory mediators from glial cells as well as glial and neuronal apoptosis. *Am J Pathol* 2008; **173**(5): 1415–1427.
- [9] Shaw SE, Day MJ, Birtles RJ, Breitschwerdt EB. Tick–borne infectious diseases of dogs. *Trends Parasitol* 2001; **17**: 74–80.
- [10] Shkap V, Kocan K, Molad T, Mazuz M, Leibovich B, Krigel Y, et al. Experimental transmission of field *Anaplasma marginale* and the *A. centrale* vaccine strain by *Hyalomma excavatum*, *Rhipicephalus sanguineus* and *Rhipicephalus (Boophilus) annulatus* ticks. *Vet Microbiol* 2009; **134**(3–4): 254–260.
- [11] Morgan NO. Potential impact of alien arthropod pests and vectors of animal diseases on the U.S. livestock industry. In: Pimentel D, editor. *CRC Handbook of pest management in agriculture*. 2 ed. Boca Raton: CRC Press Inc.; 1991, p. 99–105.
- [12] Kivaria FM. Estimated direct economic costs associated with tick–borne diseases on cattle in Tanzania. *Trop Anim Health Prod* 2006; **38**: 291–299.
- [13] Shemshad M, Shemshad K, Sedaghat MM, Shokri M, Barmaki A, Baniardalani M, et al. First survey of hard ticks (Acari: Ixodidae) on cattle, sheep and goats in Boeen Zahra and Takistan counties, Iran. *Asian Pac J Trop Biomed* 2012; **2**(6): 489–492.
- [14] Youssefi MR, Keighobadi M, Asnaashari MY. Ixodid tick species infesting sheep and cattle in Kelardasht part (Chaloos). *J Entomol* 2008; **5**(1): 56–58.
- [15] Nasibeh HV, Zakkyeh T, Hassan V, Reza Y, Morteza HV, Ail OM. Survey of tick species parasiting domestic ruminants in Ghaemshahr county, Mazandaran province, Iran. *Asian Pac J Trop Med* 2010; **3**(10): 804–806.
- [16] Razmi GR, Glinsharifdini M, Sarvi S. Prevalence of Ixodid ticks on cattle in Mazandaran province, Iran. *Korean J Parasitol* 2009; **4**(45): 307–310.
- [17] Nabian S, Rahbari S. Occurrence of soft and hard ticks on ruminants in Zagros Mountainous Areas of Iran. *Iranian J Arthropod–Borne Dis* 2008; **2**(1): 16–20.
- [18] Esmailnia K, Aharipour V. Survey of sheep and goat in Savajbulagh and Abic area. Proceedings of the 5th National Iranian Congress of Parasitology; 2005 November 15–17; Tehran, Iran. p. 178.
- [19] Radfar MH. Evaluation of tick infestation in cattle, sheep, goat and camel in South East of Iran. Proceedings of the 5th National Iranian Congress of Parasitology; 2005 November 15–17; Tehran, Iran. p. 193.