

***Ixodid* tick and the influence of age and sex of camel on tick infestation rates in one-humped camel (*Camelus dromedarius*) population in the Northeast of Iran**

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Abstract

This survey was carried out in eleven towns and cities in the three provinces of Northeast Iran (Khorasan Razavi, Northern Khorasan, and Southern Khorasan) during the period from May 2012 to January 2013 to identify the distribution of different tick species infesting camels and to evaluate the influence of sex and age of camels on the infestation rate of ticks. A total of 200 camels were examined and 480 ticks were collected (347 males and 133 females). Tick infestation was observed in 171 (85.5%) camels. *Hyalomma dromedarii* was found to be the predominant tick species (90.7%). Other tick species were found in low numbers and were as follows: *Hyalomma anatolicum* (6%), and *Hyalomma marginatum* (2.9%), *Hyalomma asiaticum* (0.4%). Significant differences were observed in tick burden between females and males ($p < 0.01$). Comparison of older and younger animals showed no significant difference in the number of ticks ($p > 0.05$).

Keywords: Frequency; Ticks; Camels; Iran; Khorasan

Introduction

Ticks are hematophagous arthropods belonging to the class *Arachnids*. Hard tick family *ixodidae* consist of 694 species (Anderson *et al.*, 2004; Akhtar *et al.*, 2011). They are the major vectors of pathogens in animals and humans. Injuries and diseases related to ectoparasites are more prevalent and severe than what is commonly perceived. Ticks cause widespread distress and morbidity and act as vectors of disease and affect the economic conditions of camel-rearing. The ability of a camel to survive in harsh environments, its endurance in

prolonged droughts, and above all, its high potential to convert the scanty resources of desert into milk and meat makes it important to pastoralists (Wosene, 1991).

The main effect of tick infestation in one-humped camel is severe to mild anemia and loss of appetite leading to a reduction in growth rate and decreased productivity. Tick infestation also results in increased calf mortality (Nelson., 1977; Schwartz *et al.*, 1983; Hart., 1990). There are some reports on the distribution of tick fauna in Iran (Rahbari *et al.*, 2007; Nabian *et al.*, 2009; Salim abadi *et al.*, 2010; Razmi *et al.*, 2011; Nourollahi Fard *et al.*, 2012). This survey was carried out to identify the frequency of infestation by different tick species in camels and to investigate the influence of sex and age of camels on the tick infestation rate and identification of sex ratio in Northeastern Iran.

Materials and Methods

The study was conducted in three provinces of Iran These provinces are located at 55° 17'2" - 61° 15'2" E and 30° 24'2" -38° 17'2" N in Northeastern Iran (Fig 1). North Khorasan is a mountainous region with a temperate cold weather. Khorasan Razavi is a semi-desert region with mild weather. South Khorasan is a semi-desert region experiencing arid conditions. Average annual rainfall is approximately 300-400mm in the northern areas and 150 mm in the southern areas. From May 2012 to January 2013, eleven cities

and towns were selected randomly among the noted areas as a “cluster” and at least 14 camels were sampled from each cluster.

All visible ticks were collected from the animals. Ticks from each animal were preserved in separate vials containing 70% ethyl alcohol. The vials were labeled with the date of collection, animal number, sex, age, and area. Estimation of ages of camels was performed by the herdsman and recognized based on the dental eruption. The collected ticks were brought to the laboratory and identified under a stereo-microscope according to general identification keys (Kaiser and Hoogstraal., 1963; Walker *et al.*, 2003; Apanaskevich and Filippova., 2007; Estrada-Pena *et al.*, 2013). Data was analyzed using the Chi-square test and the prevalence of tick species was assessed using descriptive statistics. Location of noted research is shown on the GIS map.



Fig. 1. Khorasan (North, Razavi, South), the study areas are shown on Iran’s map (Map zones, 2013)

Results

A total of 200 camels were examined. Tick infestation was observed in 171 camels, and 480 *ixodid* ticks (133 females and 347 males) were collected from different regions in the Khorasan provinces (Table 1).

One genus was identified as *Hyalomma*. Four species were reported as the major tick species infesting camels in these areas (Table 2). Among these, *H.dromedarii* was the most predominant

tick species (90.7%) followed by *H.anatolicum* (6%), *H.marginatum* (2.9%), and *H.asiaticum* (0.4%).

The effect of camel’s age on the tick infestation was not significant. Significant differences were observed in tick burden between females and males camel ($p<0.01$). Ratio of male ticks was higher than female ticks (OR=2.61).The relative frequency was 72.2% male ticks and 27.8% female ticks.

Table 1. Number and sex of ticks collected from different regions in northeast of Iran

Area	No. Male	No. Female	Total	Ratio of Male to Female
Nehbandan	27	9	36	3
Sarayan	28	23	51	1.21
Birjand	41	7	48	5.85
Kani mani	26	24	50	1.08
Boshroyeh	52	7	59	7.42
Robatsang	32	0	32	32
Quchan	28	13	41	2.15
Sabzevar	18	13	31	1.38
Mashhad	31	17	48	1.82
Chehl dokhtaran	28	6	34	4.66
Mangale	36	14	50	2.57
Total	347	133	480	2.60

Table 2. Frequency and sex of ticks infesting in camels in different areas of Khorasan

Tick spp	Male	Female	Total
<i>H. dromedarii</i>	307(70.6%)	128(29.4%)	435(90.7%)
<i>H. marginatum</i>	10(71.4%)	4(28.6%)	14(2.9%)
<i>H. anatolicum</i>	29(100%)	0(0%)	29(6%)
<i>H. asiaticum</i>	1(50%)	1(50%)	2(.4%)
Total	347(72.2%)	133(27.8%)	480(100%)

Discussion

In the current study, only four species were observed from a single genus *Hyalomma*. Population frequency of *H.dromedarii* (90.7%) was higher than the others and *H.asiaticum* had the lowest frequency (0.4%). *H.marginatum* comprised about 2.9% and *H.anatolicum* accounted for 6% of total collected species. In this study, *H.dromedarii* was found to be the most dominant species and this is in agreement with the results obtained by Salim abadi *et al* in Yazd province (Salim abadi *et al.*, 2010), Vanstraten and Jongejan in Egypt (Vanstraten and Jongejan., 1983), Alwaer in Libya (Alwaer., 2004), Lawal *et al* in Sokoto Nigeria (Lawal *et al.*, 2007), Maha *et al* in Sudan (Maha *et al.*, 2010) Karral *et al* (Karrar *et al.*, 1963) and Elghali (Elghali., 2005). In addition to *H.dromedarii*, Karrar reported the presence of *Rhipicephalus sanguineus* and *Rhipicephalus praetextatus (simus)*, (Karrar *et al.*, 1963) but these species were not encountered in our study. Moreover, Diab *et al* found *H.impeltatum* (Diab *et al.*, 2001) but this finding is not in accordance with our study. Nabian *et al* reported that *H.dromedarii* and *H.schulzei* are commonly found in camels and rarely in cattle in semi-desert areas of Iran (Nabian *et al.*, 2009). *H. schulzei* was not found in our study but our findings are in concordance with those reported by Nourollahi Fard (Nourollahi Fard *et al.*, 2012). We believe that the

differences in genera and species in distinct regions can depend on the climate. Significant differences were observed in tick burden between females and males ($p < 0.01$) and the same results were reported by Elghali (Elghali and Hassan., 2009). However, this finding contradicts the results obtained by Maha *et al* (Maha *et al.*, 2010). We believe that these significant differences are related to hormonal changes, pregnancy, and lactation in females, which results in lower resistance to tick infestation.

We did not observe higher number of ticks in older animals in comparison with younger ones in our study ($p > 0.05$) and this is not in agreement with the finding of Megersa who reported that the total tick burden was significantly higher in camels 1-3 years of age with poor health condition (Megersa *et al.*, 2012). The relative frequency was 72.2% male ticks and 27.8% female ticks. Total tick sex ratio was 2.61. It is important to note that only females of *H.dromedarii* were found engorged and that the females of the other tick species were not engorged or only partially engorged. This may indicate host specificity of camels for *H.dromedarii*. Host specificity could also account for the lesser number of other species detected in our study. Elghali reported that *H.dromedarii* is the predominant tick species in camels in the River Nile state (Elghali and Hassan., 2009) whereas, Alwaer, studying tick infestation in sheep found *H.dromedarii*

representing only 0.5% of the tick fauna in the same area (Alwaer., 2004). The rate of anti-tick resistance of hosts depends upon the species of the host and upon the number of ticks fed up. In the case of permanent feeding of larvae during 40 days the anti-tick resistance was low or completely absent (Balashov., 1993). These findings on host preference might support our suggestion. In our study we found a special location for each age group of ticks. For example, nymphs almost always (97%) were collected from the flank region. This is not in accordance with Elghali's finding, who found a high percentage of nymphs on the back, particularly the hump region (Elghali and Hassan., 2009). Highly engorged females were always found with one or two male ticks in the long hair of camels' shoulder and the lower part of their neck. Flat female and male ticks were found on all parts of the animal's body (perineum, tail, udder, scrotum, neck, shoulder and axilla). No ticks were observed in the palpebra and external ear. Based on our findings, *H.dromedarii* is the most dominant tick species in the Khorasan region and a camel is a suitable host. The life cycle of this tick includes one, two, or three hosts. Immature ticks feed on small or large mammals, depending upon their life cycle. Females had a significantly higher tick burden.

Comparison of older and younger animals showed no significant difference in the number of ticks. Male

to female ratio of ticks is 2.61. Poor husbandry practices may be a determinant, making the animals more prone to tick infestation and strategic application of acaricide might minimize the tick burden.

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References

- Akhtar, M ., Faqir, M, Lodhi, L.A, Iftikhar, H, Irfan, Anwar, M. 2011. Immunity against Ticks-A Review. *Pak Vet J*, **31**: 1-8.
- Alwaer, O.R. 2004. Epidemiology study on camel ticks infestation in Libya and vaccine trials using Boophilus derived vaccine against *Hyalomma Dromedarii* ticks.(Un published M.SC thesis Institute Agronomique et veterinaire HASSAN 11, Morocco).
- Anderson, J.M., Am merman, N.C, Norris, D.E. 2004. Molecular differentiation of metastriate tick immature. *Vector Borne Zoonotic Dis*, **4**:334-42.
- Apanaskevich, D.A., Filippova, N.A. 2007. Larval identification of species and subspecies of the genus *Hyalomma* (Acari: Ixodidae) from Russia and neighboring territories. *Parazitolojia*, **41**:268-83.
- Balashov, I. 1993. The significance of the species classification of ixodid ticks and their hosts in the development of antitick immunity. *Parazitolojia*, **27**:369-77.

- Diab, F.M., Elkhali, G.A, Shouky, A. 2001. Bionomical of ticks collected from Sinai.2.Abundance attachment sites and density of ticks infesting Arabian camels. *Egyptian Soc. Parasitol*, **31**:479-489.
- Elghali, A. 2005. studies on camel ticks in River Nile State, sudan with particular reference to ecology and behavior of *Hyalomma Dromedarii*. Acari: Ixodide. (Un published PhD. THESIS Faculty of Veterinary Medicine University of Khartoum, Sudan).
- Elghali, A., Hassan, S.M. 2009. Ticks (Acari: Ixodidae) infesting camels in Northern Sudan. *Onderstepoort J. Vet. Res*, **76**:177-185.
- Estrada-Pena, A., Farkas, R, Jaenson, T, Koenen, F, Madder, M, Pascucci, I, Salman, M, Tarrés-Call J, Jongejan, F. 2013. Association of environmental traits with the geographic ranges of ticks (Acari: Ixodidae) of medical and veterinary importance in the western *Palearctic*. *Exp. Appl. Acarology*, **59**:351.
- Hart, B.L., et al. 1990. Behavioral adaptations to pathogens and parasites five strategies. *Neurosci. Biobehav. Res*, **14**:273-294.
- Kaiser, M.N., Hoogstraal, H. 1963. The *Hyalomma* Ticks (Ixodide) of Afghanistan. *The J. Parasitol*, **49**:130-139.
- Karrar, G., Kaiser, M.N, Hoogstraal, H. 1963. Ecology and host-relationships of ticks infesting domestic animals in Kassala Province, Sudan, with special reference to *Amblyomma lepidum*. *Bull Enomol Res*, **54**: 509-522.
- Maha, A., El, tigani, Mohammed, A.S. 2010. Ticks Infesting camels in El Butana area Mid-Central Sudan, *Sudan J. Vet. Res*, **25**:51-54.
- Megersa, B.D., Bekele, J, Adane, B, Sheferaw, D. 2012. Ticks and mange mites infesting camels of Boran pastoral areas and the associated risk factors Southern Ethiopia., *J. Vet. Medicine Anim. Health*, **4(5)** 71-77.
- Nabian, S., Rahbari, S, shayan, P, Haddadzadeh, H.R. 2007. Occurrence of Soft and Hard Ticks on Ruminants in Zagros Mountainous Areas of Iran. *Iranian J Parasitol*, **2**: 12-17.
- Nabian, S., Rahbari, S, Changizi, A, Shayan, P. 2009. the distribution of *Hyalomma* spp ticks from domestic ruminants in Iran. *Vet. Entomol*, **23**:281-283.
- Nelson, W.A., Bell, J.F, Clifford, C.M, Kierans, J.E. 1977. interaction of ectoparasites and their hosts. *J. Medical Entomol*, **13**:389-428.
- Nourollahi Fard, S.R., Norouzasl, E, Asgharynezhad, H, Salehzade, k, Kazeroni, S. 2012. Hard ticks on one-humped camel and their seasonal population dynamics in southeast Iran. *Trop. Anim. Health Prod*, **44**:197-200.
- Rahbari, S., Nabian, S, Shayan, P. 2007. Primary report on distribution of tick fauna in Iran. *Parasitol Res*, **101** supl 2:S175-7.
- Razmi, G.R., Najarnejad, V, Rashtibaf, M. 2011. Determination the frequency of *Ixodid* ticks on the sheep in Khorasan Razavi province Iran. *Archives of Razi Institute*, **66**:129-132.
- Salim abadi, Y., Telmadarriy, Z, Vatandoost, H, Chinikar, S, Oshaghi, M.A, Moradi, M, Mirabzadeh, V, Ardakan, E, Hekmat, S, Nasiri, A. 2010. Hard Ticks on Domestic ruminants and their Seasonal Population Dynamics in Yazd Province Iran. *Iranian J. Arthropod-Borne Disease*, **4**:66-71.
- Schwartz, H.J., et al. 1983. Camel production in Kenya and its constraints Productivity. *Trop Anim Health Prod*, **15**:169-78.
- Walker, A.R., Bouattour, A, Camicas, J. 2003. Ticks of domestic animals in Africa a guide to identification of species.

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(Unpublished Bioscience Report 42
Coniston Drive Edinburgh, Scotland,
UK: 1-221).

Wosene, A., et al. 1991. Traditional husbandry

practice and major health problems of
camels in the Ogden Ethiopia Nomadic
People. *Parasitol J Vet*, **29**: 21-29.