Prevalence of ixodid tick infestation of sheep in the Arasbaran region of Iran

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Abstract This survey was carried out in sheep herds of Arasbaran region in northwest of Iran. The aims of this survey were assessment of occurrence hard ticks on sheep in this region and speciation and identification of detached ticks from sheep. In addition determination of tick distribution on sheep body surface was studied. In this study 330 sheep were examined and ticks from infested animals were collected. In parasitological laboratory speciation of ticks were done by stereomicroscope and using of tick identification keys. Overall 525 ticks were collected from 132 infested sheep and speciation of these tick showed 4 genera and 6 species including: *Hyalomma marginatum marginatum* (65.33 %), *Rhipicephalus bursa* (26.66 %), *Haemaphysalis choldkovsky* (5.90 %), *Dermacentor marginatus* (1.71 %), *Haemaphysalis punctata* (0.19 %) and *Hyalomma excavatum* (0.19 %). The distribution of ticks on sheep body surface was as follow, according to its frequencies: tail (42.66 %), groin (25.71 %), axilla (24.19 %), neck (5.71 %) and sternum (1.71 %). It was concluded that *H. m. marginatum* was the dominant tick in sheep of Arasbaran region.

Keywords Tick · Prevalence · Sheep · Arasbaran region · Iran

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Introduction

Ticks are obligate blood-feeding parasites of terrestrial vertebrates. These parasites have worldwide distribution and cause considerable economic losses in domestic animals (Jongejan and Uilenberg 2004). Ticks act as vectors of some pathogenical agents including bacteria, virus and protozoa. This role of ticks is very important in public health and veterinary medicine (Mullen and Durden 2009). Tick studies initiated in Iran by Dupre in 1810 and continued in later years by Brumpt (1935), Delpy (1936), Baltazard et al. (1952), Abbasian-Lintzen (1960), Mazlum (1971) and Hoogstral and Valdez (1980). After 2000 many studies have been conducted on tick fauna in animals in different areas of Iran (Razmi et al. 2002; Telmadarraiy et al. 2004; Rahbari et al. 2007; Nabian and Rahbari 2008; Rasouli et al. 2010; Yakhchali et al. 2011).

Because there is no data about tick fauna in Arasbaran region, the aims of present study were determination of tick infestation status in sheep herds and identification of involved ticks in this region. The most important reason for selection this study area was due to importance of this area in having a rich flora (about 1,000 taxa) and fauna specially presence of rare species. This region in 1971 was conserved and UNESCO listed it as a wildlife refuge since 1976. There is not similar area in Iran. In addition, due to unique biosphere and existence of historical places, such as Babak and Avarsin forts, it has become a tourist area.

Materials and methods

Study area

This study was done in Arasbaran region in northwest of Iran. This region is a UNESCO registered biosphere in Iran

with a varying altitude from 256 m in the vicinity of Aras River to 2896 m and covers an area of 78,560 hectares. Arasbaran region is a mountainous and forested region and has rich pastures for domestic and wild animals. About 8,10,000 sheep graze in spring and summer on these pastures and autumn and winter are too cold in this region (Fig. 1).

Sample size

According to previous studies in Iran prevalence of tick infestation in sheep 55 % were considered (Rahbari et al.

2007). Based on this prevalence with 95 % confidence level and accuracy of 0.1 sample size was calculated 330.

Tick collection and speciation

During spring and summer of 2011, overall 330 sheep from 33 herds randomly were examined for tick infestation. Ticks from infested sheep were detached by curved forceps and were transferred to vials containing 70 % ethanol. For every infested sheep a questionnaire including date of sampling, age and sex of host, number of removed ticks

Fig. 1 The map of Iran and location of the study area (the black circle)

Table 1 Prevalence of tick species on infested sheep in the study area

Tick species	No. of male	No. of female	Total (%)
<i>Hyalomma marginatum marginatum</i>	219	124	343 (65.33)
<i>Rhipicephalus bursa</i>	84	56	140 (26.66)
<i>Haemaphysalis choldokovsky</i>	10	21	31 (5.9)
<i>Dermacentor marginatus</i>	4	5	9 (1.71)
<i>Hyalomma excavatum</i>	1	–	1 (0.19)
<i>Haemaphysalis punctata</i>	1	–	1 (0.19)
Total	319	206	525 (100)

Fig. 2 The seasonal distribution of hard ticks species in the study area

and location of detached ticks on host, was filled. Collected ticks were brought to the laboratory and speciation was done under stereomicroscope by using the key of Walker et al. (2003).

Results

Tick infestation was observed in 40 % (132) of examined sheep and prevalence of hard tick infestation on sheep in this region 40 % was calculated. In total, 525 ticks were collected from infested sheep. Tick speciation revealed four genera and six species of hard ticks on infested sheep (Table 1).

Seasonal prevalence of tick species in this region showed that *Hy. m. marginatum* and *Rh. bursa* had high prevalence in the spring and summer, respectively ($P \leq 0.001$) (Fig. 2).

The frequency of tick distribution on the body surface of host was determined. In infested sheep distribution of ticks on sheep body surface was respectively as follow, according to their frequencies: tail (42.66 %), groin (25.71 %), axilla (24.19 %), neck (5.71 %) and sternum (1.71 %).

Discussion

In present study, in total 330 sheep were examined and 132 (40 %) sheep were infested with Ixodid ticks. In a tick survey in four geographical zones of Iran by Rahbari et al. (2007) the occurrence ticks on sheep 55 % was reported. Yakhchali et al. (2011) in a study on diversity and seasonal distribution of Ixodid ticks in north and south of Iran reported the occurrence of tick infestation in sheep in north of Iran was 33.19 %. This finding is in close agreement with result of the present study.

In previous studies on ixodid tick fauna in Iran overall six genera and 22 species were reported by Rahbari et al. (2007) and 24 species by Mazlum (1971). In this study 525 Ixodid ticks were identified that belonged to four genera that previously were reported from Iran.

Hy. m. marginatum was the most dominant tick in the study area. In study on tick fauna in West Azerbaijan province of Iran that was done by Telmadarraiy et al. (2004), *Hy. m.* ticks were the 10 % of collected ticks and this species was not the dominant tick in this region. Interestingly their study area has been near to the present study area but their study has been done in 1998 and it is possible that climatic changes have effected on tick fauna in 13 last years. This species was reported by Maltezou et al. (2010) as the main vector for Crimean-Congo Hemorrhagic Fever (CCHF) in southern Europe. According to Mild et al. (2010) the distribution of CCHF is coincide with the geographical distribution of *Hy. marginatum*. Telmadarraiy et al. (2010) detected CCHF virus in *Hy. marginatum* in Ardabil, Iran by RT-PCR. The role of this tick in transmission of CCHF should be considered as a public health issue.

The other dominant tick in the study area was *Rh. bursa*. Telmadarraiy et al. (2004, 2010) reported this tick as most dominant tick in Ardabil and west Azerbaijan provinces in Iran. These two provinces are near the present study area. This tick is one of vectors for ovine babesiosis and can serve as vector of CCHF virus according to Shayan et al. (2007) and Telmadarraiy et al. (2010), respectively. So this tick is important in transmission of human and animal diseases.

Hae. Choldokovsky was the other species that was found in this study. Rahbari et al. (2007) reported this species in northwest of Iran and from other parts of Iran including: Caspian Sea region, Kerman, Boushehr, Khorassan. It is notable that they applied *Hae. Choldokovsky* as conspecific to *Hae. Sulcata*. This species was reported by Telmadarraiy et al. (2004) in West Azerbaijan province of Iran.

D. marginatus was reported from mountainous area of Iran by Rahbari et al. (2007). They found this tick in Khorassan, West and East Azerbaijan, Khozestan, Mazenderan, Kerman and Markazi province. Telmadarraiy et al. (2004) and Nabian and Rahbari (2008) have collected this species from West Azerbaijan province and Zagros mountainous area of Iran.

Hae. Punctata was reported in Mazenderan, Golestan, South and North Azerbaijan, Khorassan by Rahbari et al. (2007). Nabian and Rahbari (2008) found this species in Zagros mountainous area of Iran.

H. excavatum was another species that identified in this study. According to Rahbari et al. (2007) this species existed all over Iran.

Hy. m. marginatum and *Rh. bursa* were dominant ticks in spring and summer, respectively. The highest prevalence of *Rhipicephalus* spp. has been reported in summer by Telmadarraiy et al. (2004) from Iran. Although this finding is the same as result of present study, but the finding of these researchers about seasonal fluctuation of *Hyalomma* spp. is not in accordance with result of the present study and they reported high prevalence of *Hyalomma* spp. in autumn. Ica et al. (2007) in a study on Seasonal fluctuation of tick species in kayseri region of Turkey reported that *Rhipicephalus* species were more prevalent in summer. These researchers found *Hyalomma* species in spring, summer and autumn with a peak in summer in their study area.

In this study the ticks distribution on body surface of infested sheep according to their frequencies were tail, groin, axilla, neck and sternum, respectively. The highest tick aggregation was reported on fat tails of infested sheep by Yakhchali et al. (2011). Rasouli et al. (2010) in a study on infested sheep in Maragheh city concluded that the highest tick aggregation site was head and tail, axilla and groin were next positions. It seems that species differences among detached ticks could be the cause of disagreement.

This study was the first survey on tick fauna and sheep infestation rate to hard ticks in this region. It can be concluded that *H. m. marginatum* was the most dominant tick on infested sheep in this region.

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