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A survey on cattle hard ticks fauna in Maragheh city, Iran

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ABSTRACT

Ticks are the most important ectoparasites which inflict heavy economic losses to livestock and transmit viral, rickettsia, bacterial and protozoal diseases. *Ixodidae* family is one of the most great tick family of domestic animals. So far, 13 different kinds and 650 species in five subgroups have been reported. The aim of this research is to assess quantitatively the extent of cattle infestations to these different ticks and also to identify the diversity of the species found in Maragheh. In this survey, carried out throughout fall 2015 to the end of summer 2016, a total number of 328 ticks were collected and identified including 224 *Hyalomma* spp. (68.30%), *Rhipicephalus* spp. 98 (29.88%), *Dermacentor* spp. 3 (0.91%) and *Boophilus* spp. 3 (0.91%) as the minimum infestation rate. From seasonal infestation prevalence aspect, in spring, 168 ticks, in summer 89 ticks and in autumn and winter 45 and 26 ticks were respectively, found on the cattle. Maximum infestation of cattle in summer and minimum in winter were observed. The maximum rate of the found ticks was observed in groin and the minimum was observed in testicle surfaces.

بررسی فون کنه‌های سخت گاو در شهر مراغه، ایران

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چکیده

هدف از مطالعه حاضر، ارزیابی گسترش آلودگی گاوهای شهرستان مراغه به گونه‌های مختلف کنه‌های سخت از نظر کمی و همچنین شناسایی تنوع گونه‌ای کنه‌های یافت شده می‌باشد. . در این مطالعه که از ابتدای پائیز ۱۳۹۴ تا انتهای تابستان ۱۳۹۵ انجام شده است از کل گاوهای مورد بررسی در شهرستان مراغه، ۳۲۸ کنه جمع‌آوری و شناسایی گردید که شامل ۴ جنس و ۸ گونه بود. هیالوما آناتولیکم آناتولیکم با فراوانی ۱۵۱ (۴۶/۰۶ درصد) بعنوان بیشترین عامل آلودگی و ریپی سفالوس تورانیکوس با فراوانی ۲ (۰/۶۱ درصد) بعنوان کمترین عامل آلودگی شناسایی شدند در حالی که بعد از هیالوما آناتولیکم آناتولیکم، ریپی سفالوس بورسا با فراوانی ۵۸ (۱۷/۵۸ درصد)، هیالوما آناتولیکم اکسکاواتوم با فراوانی ۴۱ (۱۲/۵۰ درصد)، ریپی سفالوس سانگوینوس با فراوانی ۳۸ (۱۱/۵۹ درصد)، هیالوما دتریتوم با فراوانی ۳۲ (۹/۷۶ درصد) و هر یک از درماسنتور مارژیناتوس و بوآفیلوس آنوالتوس با فراوانی ۳ (۰/۹۱ درصد) به ترتیب بالاترین آلودگی بودند. در تحقیق حاضر، از لحاظ شیوع فصلی آلودگی به کنه سخت، در بهار ۱۶۸ کنه، در تابستان ۸۹ کنه و در پاییز و زمستان به ترتیب ۴۵ و ۲۶ کنه یافته شد و بیشترین میزان آلودگی در گاوها در فصل بهار و کمترین میزان آلودگی در فصل زمستان مشاهده شد. بیشترین پراکندگی کنه در کشاله ران و کمترین پراکندگی کنه در روی بیضه‌ها مشاهده شد.

واژه های کلیدی: کنه سخت، خانواده *ایکسودیده*، *هیالوما*، *ریپی سفالوس*، گاو

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INTRODUCTION

Ticks are hematophagous ectoparasites that are known as pests and vectors of a wide range of diseases of humans, livestock, pets, and wild animals. It has been estimated that about 80% of the world cattle population is infested with ticks [1]. Ticks have a variety of direct and indirect effects on their hosts. Tick infestations can cause considerable irritation in animals and can lead to severe disorders, such as blood loss, general stress, damages to hide and skins, tick paralysis, and tick toxicosis [2, 3]. In Middle East, taxonomically accurate information on tick species is limited, and the tick-borne diseases of this region remain poorly characterized. The relationship between ticks and tickborne pathogens in the region is largely unknown, even though the presence of these pathogens has been recognized for many years and the number of new pathogens discovered in ticks has increased markedly [4-6]. Advances have recently been made in Middle East infectious disease research, but vector-borne diseases are still misdiagnosed and underestimated because of inadequate clinical training and limited surveillance and laboratory capacity. Tick species that occur in Iran have been discussed by Toumanoff in 1944 [7]; Hoogstraal *et al.* as well as Wilson between the 1960s and 1980s [8-13]; Petney and Keirans in the mid-1990s [14-17]; Robbins *et al.* in 1996 [18] and Kernif *et al.* in 2012 [4] the most recent work. Cattle are reared in this area by releasing them into the forest and by periodically moving them close to or under village houses. Such practices may facilitate interactions between ticks and their hosts, including the exchange of ticks between wild and domestic animals. They may also lead to dispersal of the tick population, thereby potentially increasing the risk of tick-borne disease transmission. The goal of this research is to assess quantitatively the extent of cattle infestation to these different kinds of ticks, family from quantitative aspect and also to identify the diversity of the species found in Maragheh.

MATERIALS AND METHODS

The present study was performed carried out in 48 different rural areas of Maragheh city in Eest Azarbayjan of Iran. It is located at 37°23′21″N 46°14′15″E. Throughout a year, 12 sampling periods (each month were one period) were referenced to 48 designated geographical areas, so that at each stage 4 region (one of each west, east, north and south areas) were examined. In this study, a total number of 384 cattle (198 female and 186 male) from different age groups (less than 1 year, 1–2 years old, 2–3 years old, and over 3 years old) were selected by stratified random sampling over the course of 1 year (October 2015 to September 2016). In each stage, 8 samples were randomly selected for each of the four study areas. The examined cattle were raised under traditional husbandry practices (grazing on pastures during the day) without regular *acaricide* treatment. A total of 328 ticks were collected from cattle. Data for all specimens, including date, sex, age, and number of ticks, were recorded. All of the methods used in this study were confirmed by the Ethics Committee of Islamic Azad University of Urmia, respecting currently accepted animal welfare rules in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 and 2008.

At first, the animal was fastened before any inspection, and then different parts of the body were examined. Due to the location of most

ticks in the animal's low-lying areas, the contractions of the perineal region, groin, under the scapula, breast, Genital organs and cattle neck were reviewed. Ticks were removed from the host with rubbing alcohol pads surrounding the skin and blunt pointed forceps, avoiding damage to the mouthparts of the ticks and the skin of host [19]. The collected specimens were transferred into holding tubes contain 70% ethanol (Merck, Darmstadt, Germany) and transferred to the Parasitology Research Laboratory of Islamic Azad University, Urmia, Iran. Following examinations under a stereomicroscope, ticks were identified by morphological characteristics using the key identification guide [20]. In some samples, 5% potash solution was used to remove sediment and clarification. For data analysis, descriptive statistics for qualitative data with 95% confidence intervals (95% CI) were used. Collected data were analysed by Excel, v.2013 and SPSS, v.19 and the chi-square $\chi 2$ test was run to determine the relationship between the variables (sex, different parts of the body and season).

RESULTS

According to the results, 68 of the 384 cattle (17.71 %) including 9 (13.24%) male and 59 (68.76%) female were diagnosed as being infected with ticks. 328 ticks were collected and identified. A number of 224 *Hyalomma* spp. (68.30%) determined as maximum infestation, 98 *Rhipicephalus* spp. (29.88%), 3 *Dermacentor* spp. (0.91%), 3 *Boophilus* spp. (0.91%) determined as minimum infestation rate were identified. The prevalence of tick species in cattle is examined in Table 1 and Figure 1. From seasonal infestation prevalence

Table 1. The prevalence of tick species in examined cattle in Maragheh, Iran

Tick species	Frequency of infected cattle						Frequency of tick							
	Male		Female		Total		M. Mature		F. Mature		Nymph&Larvae		Total	
	No.	%	No	%	No.	%	No.	%	No.	%	No.	%	No.	%
Hyaloma anatolicum anatolicum	4	5.88	24	35.29	28	41.18	64	19.51	79	24.09	8	2.43	151	46.04
Hyaloma anatolicum excavatum	1	1.47	7	10.29	8	11.76	15	4.57	23	7.01	3	0.91	41	12.50
Hyaloma deteritum	-	0.00	7	10.29	7	10.29	10	3.05	22	6.71	-	0.00	32	9.76
Rhipicephalus bursa	3	4.41	8	11.76	11	16.18	18	5.49	38	11.59	2	0.61	58	17.68
Rhipicephalus sanguineus	1	1.47	8	11.76	9	13.24	20	6.10	18	5.48	-	0.00	38	11.59
Rhipicephalus turanicus	-	0.00	1	1.47	1	1.47	-	-	2	0.61	-	0.00	2	0.61
Dermacentor marginatus	-	0.00	3	4.41	3	4.41	-	-	3	0.91	-	0.00	3	0.91
Boophilus annulatus	-	0.00	1	1.47	1	1.47	1	0.30	2	0.61	-	0.00	3	0.91
Total	9	13.24	59	86.76	68	100	128	39.02	187	57.01	13	3.96	328	100

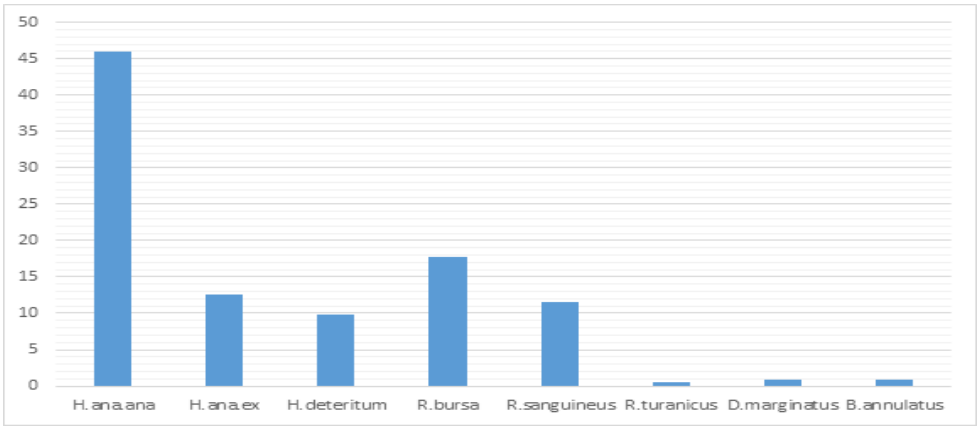

Figure 1. Relative frequency of identified ticks in cattle in Maragheh, Iran.

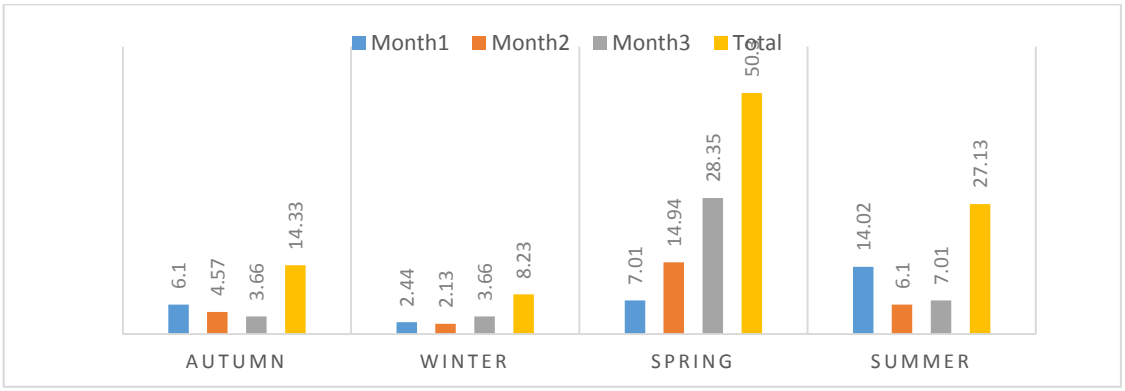

Figure 2. The relative frequency of the prevalence of ticks in different months in Maragheh, Iran.

Table 2. Distribution of hard tick in different parts of the body of cattle in Maragheh, Iran.

Tick genus	Frequency		Testicles		Breast		Perina		Groin	
	No.	%	No.	%	No.	%	No.	%	No.	%
Hyaloma.spp	224	68.30	12	5.35	31	13.84	82	36.60	99	44.20
Rhipicephalus.spp	98	29.88	4	4.08	13	13.26	42	42.86	39	39.80
Dermacentor.spp	3	0.91	0	0.00	0	0.00	1	33.33	2	66.66
Boophilus.spp	3	0.91	0	0.00	0	0.00	3	100	0	0.00
Total	328	100	16	4.88	44	13.41	128	39.02	140	42.68

aspect, in spring, 168 ticks, in summer 89 ticks and in autumn and winter 45 and 26 ticks were respectively, found on the cattle. Maximum infestation of cattle in summer and minimum in winter was observed. The maximum rate of the found ticks was observed in groin and the minimum were observed in testicle surfaces (Table 2 and Figure 2).

DISCUSSION

There are some studies on the prevalence of tick infestation in cattle in different parts of Iran and other countries, including 32.49%, 75.8%, and 24.63% in the Sari, Golestan, and Kermanshah regions of Iran, respectively as well as 86.1%, 72.9%, and 29.6% in Ethiopia, Pakistan, and Turkey, respectively [3, 21-39]. According to the results, 68 out of the 384 (17.71%) examined cattle were infected with hard ticks including *Hyaloma anatolicum anatolicum,Hyaloma anatolicum excavatum,*

Hyaloma deteritum, Rhipicephalus bursa, Rhipicephalussanguineus, Rhipicephalus turanicus, Dermacentor marginatus and *Boophilus annulatus.*In this investigation, the frequency of tick infestation was lower than that of three recentstudies carried out in Turkey and Iran, where 34% and 36.90% of cattle were infested with at least one tick species [40-42]. The variation in the prevalence of tick infestation might be due to geographical distribution, climate condition, and management systems [37]. Furthermore, the methods and some other factors used in the field study could also affect the results. The data analysis indicated that there is a statistically significant difference between species. From 328 collected tick samples, *Hyaloma anatolicum anatolicum* was the most prevalent tick (46.04 %) and *Rhipicephalus turanicus* was the least (0.61%), at $P<0.05$, whereas *Dermacentor marginatus* and *Boophilus annulatus* with (0.91%) had the very close prevalence to the minimum. It indicates the absolute dominance of the genus Hyalomma in particular, *Hyaloma anatolicum anatolicum.* Several research on ixodid ticks revealed that the genus Hyalomma was predominant in Iran [2, 43-46]. Ghashghaee *et al.* reported, *R. sanguineus* was the major tick that infested cattle, which was not consistent with our results [42].

In the current investigation, there was a significant difference between prevalence of ticks in different seasons, hard ticks were more prevalent during spring than other seasons, while the fewest were observed in winter ($p<0.05$). The results of our study are similar to the findings by Sofizadeh et al. and Ghashghaei et al. [38, 42]. In contrast, Yakhchali and Hosseine [47] reported higher tick prevalence in winter and lower prevalence in summer seasons. It is an established fact that climate condition and temperature affect tick prevalence [3].

CONCLUSION

In the current study, the frequency distribution of canals collected according to different parts of the body of cattle's' body of the cattle was considered. According to the results, ticks related to the genus *Hyaloma* and genus *Rhipicephalus* are found in all four parts of the body of the cattle, while the genus *Dermacentor* was observed on the perinea and groin, The dispersion of the genus *Boophilus* was limited to the perina. Between the four parts of the body, the groin (with 42.68% average inclination to ticks) had highest variation and contamination with ticks, and the surface of the testicle with 4.88% average tick inclination had the least variation and frequency of ticks ($p<0.05$). Although many researchers have identified specific hosts for hard ticks in some cases, but there are no such consensus among a few species. Recent studies on the location of the parasite have shown that most tick species prefer specific part of the body to operate. Also, the results of the studies show that head and ear areas, groin, subcutaneous, and perinea are more exposed to *Ixodidae* ticks than other anatomical points [46].

ETHICS

All procedures of the current research have been performed based on the ethical standards.

CONFLICT OF INTEREST

There is no conflict of interest.

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