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ORIGINAL RESEARCH ARTICLE

Prevalence of Ixodidae in sheep brought for slaughter in Adrar municipal abattoir, Southwest Algeria

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Abstract. A two year survey was carried out to investigate the prevalence of Ixodidae on local sheep brought for slaughter in Adrar municipality abattoir, southwest Algeria. Of the total 960 examined sheep, 285 (29.7%) were infested by one or more of tick species. Tick infestations were found throughout the study period. A total of 784 ticks were collected, and seven species which grouped under two genera were inventoried. The tick spices collected included *Hyalomma impeltatum, H. marginatum marginatum, H. dromedarii, H. detritum detritum, Rhipicephalus sanguineus, R. guilhoni* and *R. evertsi evertsi*. The most abundant species *were Hyalomma impeltatum and Rhipicephalus sanguineus*. The prevalence of other species was very low. The presence of *Rhipicephalus guilhoni* and *H. marginatum marginatum* in the study area was an interesting finding. The present study provides baseline data on the status of the parasite in the area.

Keywords: Prevalence; Ixodidae; Sheep; Abattoir; Adrar; Algeria.

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Introduction

Ticks are obligate blood-feeding ectoparasites (Ostfeld et al., 2006) which transmit a greater variety of pathogenic microorganisms and are the cause of significant economic losses (Hounzangbe-Adote et al., 2001; Jongejan and Uilenberg, 2004; Rajput et al., 2006). The world's tick fauna comprises 896 species, which are grouped under three families (Guglielmone et al., 2010) and distributed worldwide as parasites of wild and domestic vertebrates except fishes (Nava et al., 2009). Among them, 14 Ixodidae species and sub-species have been inventoried in Algeria (Walker et al., 2003). In North Country, a few studies have been conducted on various aspects of ticks (Yousfi-Monod and Aeschlimann, 1986; Boulkaboul, 2003; Abdulhussain and Cozma, 2005; Meddour-Bouderda and Meddour, 2006; Benchikh-Elfegoun et al., 2007); much is known about the species composition and geographical distribution (Walker et al., 2003). In South Country, data about the species composition is scarce; moreover, the presence of these parasites on animals is not taken into consideration very seriously by some owners. In a recent study that we have carried out in Adrar abattoir to investigate Ixodidae parasitism in camels, a high prevalence of 99.41% was

registered and nine tick species were inventoried (Bouhous et al., 2008). Further studies need to be carried out to enhance our knowledge about ticks infesting livestock in our country as well as their geographical distribution, principally in desert areas. The main purpose of this investigation was to determine the prevalence of Ixodidae infesting local sheep brought for slaughter in Adrar municipality abattoir.

Materials and methods

The study was carried out from January 2009 to December 2010 at Adrar municipality abattoir (27°53′25" north and 000°17'46" west), southwest Algeria. This area is desert, characterised by a hot and arid climate. Nomadic system of grazing is the most widely adopted management practice in this area.

The studied animals were indigenous sidaoune breed sheep brought for slaughter from Bordj Badji Mokhtar locality (21°19' north and 0°56' east), which is the most important grazing area of the study region. No tick control program is carried out in this area. Sheep are placed in local farms for few days, weeks or sometimes months before they are slaughtered.

The sample size was calculated by considering 50% expected prevalence and 95% confidence interval with a 5% desired absolute precision. Therefore, the annual determined sample size was 384 sheep. The slaughterhouse was visited once weekly and sheep were selected by systematic random sampling method. Sheep were examined at the rate of 40 heads per month; consequently, a total of 480 sheep were examined annually for a better conclusion.

The ticks were located by visual appraising and by running the palm of the hand across the body. All visible ticks were manually removed from the body of the infested sheep, taking care to avoid damage to the mouthparts. The ticks collected from each animal were stored in labelled bottles with 70% ethyl alcohol and brought to the laboratory, counted and identified under a stereomicroscope according to general identification keys as given in Walker et al. (2003).

Data recorded included the prevalence of infestation; levels of infestation (mild, 1-25% animals with tick infestation; moderate, 25-50% animals with tick infestation; heavy, more than 50% animals with tick infestation) as described by Latha et al. (2004); stage of tick collected, monthly mean intensity and tick species. Any animal presented with any life stage of the ticks was considered as positive.

Differences between the prevalence of infestation were assessed using Chi-square test, and Mann-Whitney test was used to test the difference in mean intensity.

Results

Out of the total 960 heads of sheep examined, 285 (95% confidence interval: 29.7% ± 2.9) were infested with ticks. The prevalence registered during the first year study (95% confidence interval: 33.8% ± 4.2) was significantly higher ($p < 0.05$) as compared to the prevalence registered in the second year study (95% confidence interval: 25.6 ± 3.9). Tick infestation was present throughout the two years, and heavy levels of infestation were observed only in the first year of the study (figure 1). The monthly magnitude of the prevalence (figure 1) in each study year and between the two years was statistically significant ($p < 0.05$).

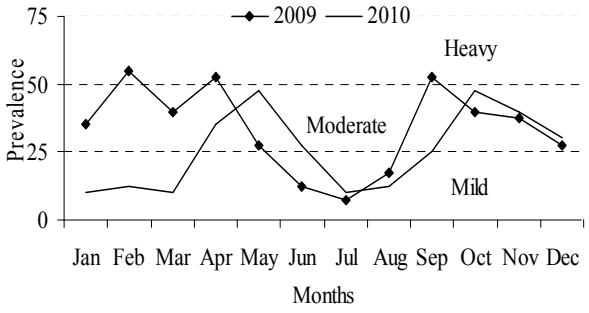

Figure 1. Monthly prevalence and levels of tick infestation

Overall, a total of 784 ticks were collected during this survey. Among these, 7 (1.3%) nymphs, 446 (85.1%) males and 71 (13.5%) females in the first study year, and 16 (6.2%) nymphs, 187 (71.9%) males and 57 (21.9%) females in the second study year. No larval stage

of ticks was found on the sheep. The magnitude of monthly mean intensity (figure 2) in each study year and between the two years was never significantly different ($p > 0.05$).

Seven Ixodidae species belonging to *Hyalomma* and *Rhipicephalus* genus were inventoried (table 1). All nymphs were *Hyalomma*. The most abundant species were *Hyalomma impeltatum* and *Rhipicephalus sanguineus* (table 1). The prevalence of other species was very low (table 1).

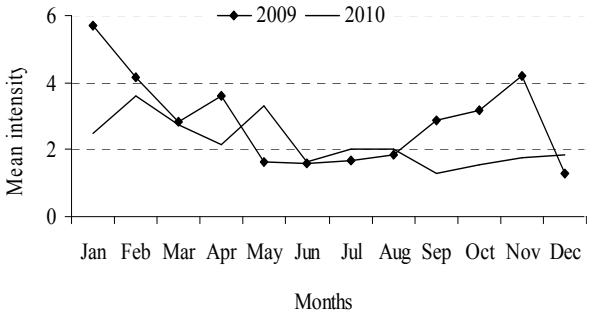

Figure 2. Monthly mean intensity of ticks

Table 1. Inventory and frequency of adult tick species in sheep

Tick species	Total number of spices (frequency)		Total
	2009	2010	
Hyalomma impeltatum	414 (80.1)	158 (64.8)	572 (75.2)
H. marginatum marginatum	15 (2.9)	4 (1.6)	19 (2.5)
H. dromedarii	6 (1.2)	3 (1.2)	9 (1.2)
H. detritum detritum	1 (0.2)	1 (0.4)	2 (0.3)
Rhipicephalus sanguineus	74 (14.3)	74 (30.3)	148 (19.4)
R. guilhoni	6 (1.2)	4 (1.6)	10 (1.3)
R. evertsi evertsi	1 (0.2)	0	1 (0.1)

Discussion

The present study is the first to gather information on ticks infesting local sheep in Adrar region, southwest Algeria. The results showed that ticks are common parasites in sheep brought for slaughter at the official abattoir of Adrar locality. Ticks were observed throughout the survey period, which indicated that the season presented ni influence. The significant varying of tick prevalence and monthly magnitude in each study year and between the two years might be attributed to a complicated interplay of factors such as climate, vegetation cover, host density, grazing, habits, study period, life cycle and types of animal husbandry.

The absence of larvae and the near absence of nymphs might be attributed to the fact that sheep are not the suitable hosts of the immature stages of almost all of the tick species identified during this survey. According to Walker et al. (2003), immature stages of the dominant species namely *H. impeltatum* and *R. sanguineus* feed on small animals (rodents, hares and ground birds) and dogs respectively.

Seven species of ixodidae were observed to infest sheep. Of them, *Hyalomma dromedarii* and *H. impeltatum* were previously recorded in this area by Chauve et al. (1990) and during our earlier survey on the parasite in camels in Adrar Abattoir (Bouhous et al., 2008). Likewise, *H. detritum detritum, R. sanguineus* and *R. evertsi evertsi* have been previously reported from the area during our above mentioned survey.

The presence of *H. marginatum marginatum* and *Rhipicephalus guilhoni* in the area is an interesting finding. Referring to the species composition and geographical distribution of ticks in Africa as recorded by Walker et al. (2003), it seems that *H. marginatum marginatum* was observed for the first time in this area, and *R. guilhoni* was observed for the first time in Algeria.

According to Walker et al. (2003), *H. marginatum marginatum* is known to survive

in areas with humid Mediterranean climate and steppe climates and can not survive under desert conditions; *H. detritum detritum* is recognized as a prevalent tick species in northern Algeria with Mediterranean climate but not in the southern country; *R. guilhoni* is distinguished to survive in steppe and savanna climatic regions of Africa in a broad band roughly between 6° and 18° N, from Senegal in the west to Ethiopia in the east; and finally, *R. evertsi evertsi* is confined to the Afrotropical zoogeographical region in sub-Sahara Africa. It seems that movement of tick infested livestock from northern country, with *H. marginatum marginatum* and *H. detritum detritum* may have introduced these tick species into Adrar town. Also, *R. guilhoni* as well as *R. evertsi evertsi* might be introduced into Adrar area from Mali, where these tick species are widespread, on nomadic and/or on imported livestock. Therefore, the presence of these species on local sheep is probably linked to the sharing of habitat with the exotic infested livestock. This finding needs to be verified by conducting an intensive survey, which includes indigenous and foreign livestock, and collection of ticks from vegetation and shelters.

The occurrence in abundance of *H. impeltatum* is not surprising, since this tick species occurs mainly in areas of desert climates (Walker et al., 2003). *Rhipicephalus sanguineus* was also recorded in abundance, this may be a reflection of the fact that sheep are usually accompanied by domestic dogs which maintain a population of the tick, since domestic dogs are the host for which *R. sanguineus* is specialist (Walker et al., 2003; Horak et al., 2010). The low level of *H. dromedarii* recorded in this study may be attributed to the fact that sheep are not the preferred hosts of this tick (Walker et al., 2003), and/or sheep do not frequently come in contact with camels. Finally, the lower number of *H. marginatum marginatum, R. guilhoni* and *R. evertsi evertsi* may due to the fact that local sheep brought for slaughter were accidentally infested by these tick species.

In conclusion, this study enhances our knowledge about hard ticks infesting livestock in our country. It is important not only for livestock but also for humans, since ticks also infect humans, especially those who work in close contact with the affected animals, and some tick species identified during this survey are important vectors of disease-causing pathogens of humans and livestock. Further studies should assess the origins of the newly recorded tick species, as well as the previous recorded spices, especially *R. evertsi evertsi.*

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