

Inventory of ticks (*Ixodidae*) in goats in Souk-Ahras province, North-eastern Algeria

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Abstract

This study was conducted in four localities in the province of Souk-Ahras (Sedrata, Merahna, Henancha, and Ouledriss). The objective was to identify the different tick species found in goats and monitor their seasonal dynamics. Thirty-five goats were examined; 25 were infested with ticks, resulting in an overall infestation rate of 71.42%.

Infestation was more common in female than in male goats. The identification of the collected ticks (223) revealed three species belonging to three genera, with a predominance of *Rhipicephalus turanicus* (47.5%) with a parasite load of 4.2 ticks/goat, followed by *Hyalomma detritum* (35%) with a parasite load of 3.2 ticks/goat and *Ixodes ricinus* (16.5%) with a parasite load of 1.9 ticks/goat.

Keywords: Ticks, goats, parasite load, relative abundance, Souk-Ahras.

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Introduction

Ticks (*Arachnid: Acari: Ixodidea*) are hematophagous arthropods and obligate ectoparasites of great interest in the veterinary and medical fields, capable of infesting all types of domestic animals. Their study identified more than 900 species of ticks worldwide (Olivier et al., 2017).

These parasites are important not only for their hematophagous and irritating role, but also for the potentially emerging diseases they transmit. Many tick species are vectors of various microorganisms (protozoa, bacteria, viruses) to vertebrates. They are thus responsible for serious diseases that have a significant health and economic impact. The existence and importance of tick-borne diseases are related to complex interactions involving vectors, hosts, and the environment, requiring a better understanding of these mites in order to control their vectorial impact (Djebir, 2008).

Generally, several studies in recent years have focused on their spatial and temporal distribution, as well as the factors that influence these distributions in different regions of the world. In Algeria, few studies have been conducted on ticks. The most interesting one was conducted in 1945 over a 30-year period by Sergent et al. They indicated that ticks represent a real scourge for cattle farming and cause heavy losses in affected herds.

However, very few studies have been conducted on goat ticks in the Souk-Ahras region, apart from the studies by Aouadi (2012). This lack of information is the source of the problem we will explore in our study.

Materials and methods

Study Region

This study was conducted in the province of Souk-Ahras.

The province of Souk-Ahras is located in the far east of Algeria, approximately 700 km from Algiers. It borders Tunisia. It covers an area of 311,000 hectares, bordered to the north by the provinces of Guelma and Tarf, to the east by Tunisia, to the west by the provinces of Oum El Bouaghi, and to the south by the provinces of Tebessa (Figure 1).

It is characterized by a sub-humid climate in the north and a semi-arid climate in the south. Rainfall is recorded at up to 700 mm and 250 mm in the south, with an average of 550 mm per year and snowfall at higher altitudes. The province of Souk-Ahras was created following the country's territorial reorganization in 1984.

It comprises 10 districts and 26 communes: Mechroha, Hennacha, Merahna, Heddada, OuledDriss, AinZana, OuledMoumene, SidiFredj, Taoura, Tiffah, Souk-Ahras, Ragouba, M'daourouch, Khemissa, Sedrata, BirBouhouch, SafelElouidene, Zouabi, Terreguelt, AinSoltane, Oum El Adhaeme, Ouillene, Zaarouria, Dréa, Kedhara, and OuedKebrit.

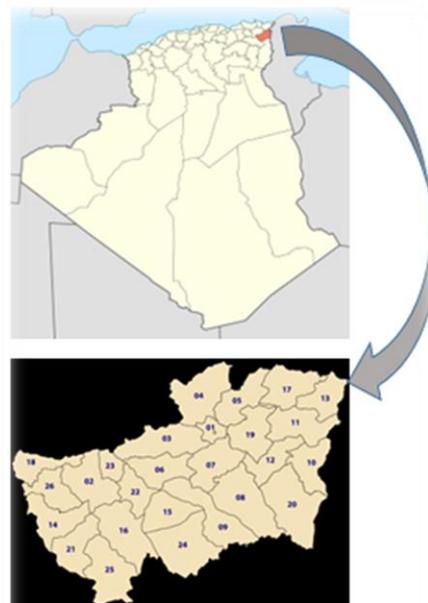


Figure 01: Location of the study area (Souk-Ahras) on the map of Algeria.

Animals and Tick Collection

Our samples were collected from goat farms spread across four areas: OuledIdriss, Merahna, Henancha, and Sadrata. During the goat examination, the animal must be restrained, after a systematic inspection of the entire body (ears, chest, udder, between the hind legs, the perineum region, and especially the thin-skinned area), and then we remove as many ticks as possible. Traction is applied in the direction of the rostrum's implantation, avoiding any rotational movement (the rostrum is the basic element of identification). We used ethanol to kill ticks attached to the animal (Figure 2).

During our study, we did not encounter any infested males. Of the 35 goats examined, only 25 were infested with ticks. The peak infestation was recorded in July. The samples collected from each animal were stored in pre-identified bottles containing 70% alcohol. Each bottle was accompanied by a sheet containing various information, including the collection date, sex, age, and region of collection.



Figure 02: Tick collection and storage

Tick Observation and Identification

Identification was performed in the Parasitology Laboratory of the Institute of Agronomic and Veterinary Sciences of Taoura (University of Souk-Ahras) using a binocular microscope. Sometimes tick identification was hampered by the presence of cellular debris or blood on the rostrum; for this reason, cleaning with a paintbrush was recommended.

Genus and species identification were performed according to Estrada's identification key (2004) based on the

observation of certain morphological characteristics of the body:

- The rostrum: length and shape;
- The eyes: presence or absence;
- Anal groove: presence or absence and position relative to the anus;
- Festoon: presence or absence.

However, species identification was based on:

- Leg coloration;
- Characteristics of the grooves;
- Scutum puncture;
- Shape of the gonopore in females and adanal plaques in males.

Results

Collection results (general data)

The total number of goats examined in our study was 35, 25 of which were found to be infested, representing an overall infestation rate of approximately 71.42%. A total of 223 ticks were collected during the study period, with an overall parasite load of 8.9 ticks/animal (223/25).

Identification of the Ticks Collected

Examination of the ticks under a binocular microscope allowed us to identify three (3) species belonging to three (3) different genera: the genus *Ixodes* (*Ixodes ricinus*), the genus *Rhipicephalus* (*Rhipicephalus turanicus*), and the genus *Hyalomma* (*Hyalomma detritum*) (Figure 3, 4 and 5).



Figure 03: *Ixodes ricinus*



Figure 04: *Rhipicephalus turanicus*



Figure 05: *Hyalomma detritum*

Study of Tick Infestation in Goats

Relative Abundance and Tick Parasite Load

According to Figure 6, we observe a predominance of the genus *Rhipicephalus* (47.5%), followed by *Hyalomma* (35%) and *Ixodes* (16.5%). Regarding the parasite load of *Rhipicephalus turanicus*, it was the highest (4.24), while the parasite load of *Ixodes ricinus* was the lowest (1.48).

According to Table 1, we observe a predominance of the genus *Rhipicephalus* in the three zones (Sedrata, Merahna, and Henancha). However, in the Ouledriss zone,

Table 1: Data on the relative abundance of goat ticks in the four study areas.

Genus / Areas	<i>Rhipicephalus</i> Relative Abundance (%)	<i>Hyalomma</i> Relative Abundance (%)	<i>Ixodes</i> Relative Abundance (%)	Number of ticks
Sedrata	22 (41,5)	19 (35,8)	12 (22,6)	53
Merahna	30 (37,5)	25 (31,2)	25 (31,2)	80
Henancha	40 (66,6)	20 (33,3)	00	60
Ouledriss	14 (46,6)	16 (53,3)	00	30
Total	106	80	37	223

the genus *Hyalomma* was predominant over the genus *Rhipicephalus*. Regarding the genus *Ixodes*, we note its absence in the Henancha and Ouledriss zones.

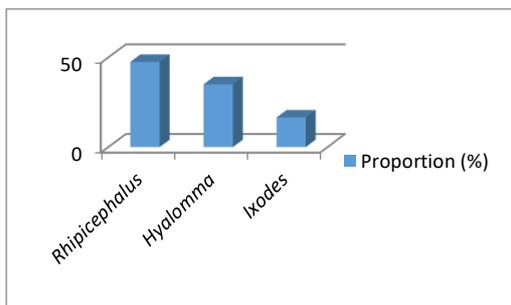


Figure 06: Relative abundance of goat ticks in the province of Souk-Ahras

Monthly Distribution of Ticks Collected

According to Figure 7, we observe that the distribution of ticks begins in April and continues until August, with a peak of activity in July.

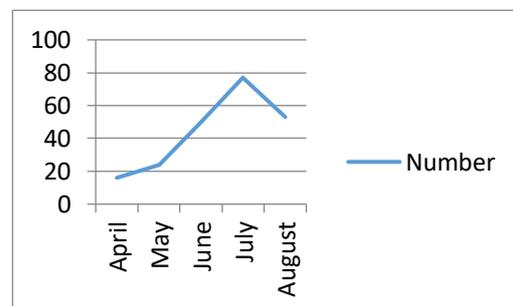


Figure 07: Monthly Distribution of Ticks Collected in the Four Zones

Number of ticks collected by genus/month

From Figure 8, we see that the monitoring and identification of the two genera, *Rhipicephalus* and *Ixodes*, revealed that the peak of activity was in July, with activity occurring from April to August. However, the peak was in August, with activity occurring from April to August for the genus *Hyalomma*.

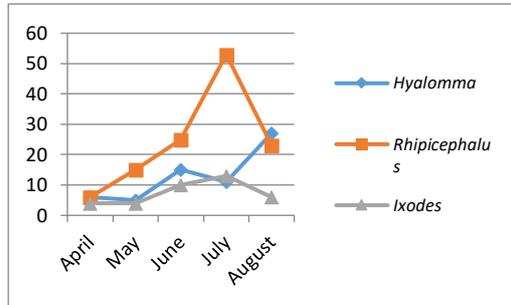


Figure 08: Number of ticks collected by genus/month.

Distribution of ticks collected by gender and sex

From Figure 9, we see that of the 223 ticks collected, 139 were females and 84 were males.

The percentage of female ticks collected from both the *Rhipicephalus* and *Hyalomma* genera was higher than that of male ticks (66% and 63.75%, respectively). However, the percentage (51.37%) of male ticks collected from the *Ixodes* genus was higher than that of female ticks (48.6%).

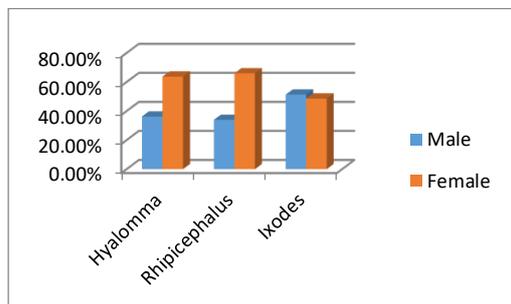


Figure 09: Proportions of ticks collected by gender and sex.

Discussion

The study of tick infestation of goats in four areas of the province of Souk-Ahras (Sedrata, Merahna, Henancha, and Ouledriss) resulted in the collection of 223 ticks from 25 infested goats, representing a parasite load of approximately 8.9 ticks/animal. Furthermore, regarding the analysis of the results relating to the identified genera, we counted three genera: *Rhipicephalus*, *Hyalomma*, and *Ixodes*, with a predominance of the first genus (*Rhipicephalus*: 47.5%). Our results are low compared to those recorded by Gueye et al. (1987) in a study in Senegal, where they noted a predominance of this genus (95.8%). However, our results are higher than those reported by Farougou et al. (2009) in Benin and Aouadi (2012) in Algeria, where they recorded 11.22% and 7.4%, respectively.

Regarding the discovery of the species *Ixodes ricinus*, which is a wild, free-living tick in woods, scrubland, and meadow edges (Bussi ras and Chermette, 1991), it is possible that the goats involved in the tick collection were in close proximity to forests, especially in the Sedrata and Merahna areas. It is also important to note the risk of transmission of Lyme disease to humans, which is due to *Borrelia burgdorferi* by this tick species.

The study of the observed parasite load is 8.9, our results exceed those observed by Aouadi (2012) in his work carried out in the Souk-Ahras region where he reported a parasite load of around 2.35 ticks per animal, this fact is perhaps due to the lack of precipitation during the year of the study (2012) which is a favorable factor for the development of ticks.

Regarding the monthly frequency of the genera, the latter revealed activity during the five months of study for the 3 genera with a peak in July for *Rhipicephalus* and *Ixodes*, on the other hand, a peak in August for *Hyalomma*. Aouadi (2012) in his study in Algeria (Souk-Ahras) reported that the genus *Hyalomma* was absent in April and September and the peak activity of *Hyalomma detritum* was in May. This difference can be explained by the fact that during our tick collection, the

temperatures in August were very high and the climate dry, since this genus (*Hyalomma*) is thermophilic and xerophilic. Furthermore, temperature is a determining factor for the duration of the life cycle of this genus, according to Bencheikh El Fegounet al. (2007).

The study of tick distribution by sex showed a predominance of female ticks. This can be attributed to the study period, which coincides with the peak activity period, and as a result, several engorged females were collected.

The study of the influence of sex on tick infestation in animals showed a greater infestation of females compared to males. This observed difference can be explained by the fact that females, in general, are more prone to infestation due to physiological conditions, which reduces their resistance.

Conclusion

The survey conducted in four areas of the province of Souk-Ahras (Sedrata, Merahna, Henancha, and Ouled Driss) resulted in the collection of 223 ticks after examining 35 goats. This survey revealed the presence of three tick species belonging to three genera: *Rhipicephalus turanicus* (47.5%), *Hyalomma detritum* (35%), and *Ixodes ricinus* (16.5%).

The Souk-Ahras region, with its characteristic bioclimatic diversity, with a sub-humid climate in the north and a semi-arid climate in the south, boasted a rich *ixodid* fauna. Identification of the species of ticks parasitizing goats revealed the presence of thermophilic species (*Hyalomma* and *Rhipicephalus* species) and one exophilic species (*Ixodes ricinus*)

Compliance with ethical standards

Conflict of interest: The authors declare that they have no conflicts of interest.

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