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Composition and Structure of Ectoparasites in Cattle in Setif Region - Algeria

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Abstract: This study was conducted to investigate the infestation of cattle by ectoparasites in the region of Setif (Algeria). Over a three-year period (2016-2018), a total of 2200 cattle were examined, revealing five species of insects (four species of lice and one myiasis) and seven species of ticks (Ixodidae). Our results indicate that 66.07% of cattle were infested with one or more ectoparasites. Among these, ixodid ticks were the most prevalent, accounting for an overall infection rate of 35.30%. The dominant tick species were *Rhipicephalus turanicus* (12.89%) and *Hyalomma marginatum* (10.05%), followed by *Hyalomma excavatum* and *Rhipicephalus bursa* at (9.4% and 8.9%, respectively). The species *Hyalomma scupense*, *Rhipicephalus (Boophilus) annulatus*, and *Haemaphysalis sulcata* had the lowest prevalence rates (5.65%, 2.02%, and 1.47%, respectively). Additionally, 783 cattle were affected by phthiriosis, with the dominant louse species being *Bovicola bovis* (19.82%), followed by *Haematopinus quadripertusus*, *Solenopotes capillatus*, and *Linognathus vituli* (at 12.77%, 8.15%, and 7.7%, respectively). In contrast, only 244 cattle were affected by a single species of myiasis (*Hypoderma lineatum*), with 2034 larvae. The seasonal dynamics of ectoparasites were evident, with seven tick species showing activity during spring and summer. All four louse species caused winter disease, while Hypodermosis due to *Hypoderma lineatum* occurred predominantly in spring and summer, extending into autumn. Interestingly, the topographical region did not significantly influence lice and Hypodermosis infestations. However, it did create a favorable environment for tick activity. There was also a racial predisposition observed in lice and ticks, in contrast to Hypodermosis, where racial factors had no impact. Finally, the influence of age and sex on ectoparasite diseases closely correlated with the breeding system.

Keywords: Ectoparasites, Cattle, Veterinary

Introduction

Cattle breeding, especially dairy cattle, is a key strategic sector of Algerian agricultural policy, and according to Moufek (2007), the number of cattle in Sétif is estimated at 10% of the national total, making it a pilot wilaya in this field, with 151 446 head of cattle in 2019, 74335 of them dairy cows. Of course, this livestock population is faced with a number of parasitic affections, more specifically external parasites, which are of great medical and veterinary importance, causing incalculable losses to livestock farming and representing a heavy burden for animals and human populations, and consequently losses for the national economy.

Knowledge of the etiological agents and their biological characteristics is essential for a rapid and accurate diagnosis, enabling the use of an appropriate curative and prophylactic therapeutic arsenal. With this in mind, we opted for this subject, the main aim of which is to inventory and identify the species of bovine ectoparasites in the southern region of the Wilaya de Sétif, and to study the influence of intrinsic (age, sex and breed) and extrinsic (season, rearing system and topography) factors on the infestation of these parasites. The work was carried out in three phases:

- a) Field survey (collection of ectoparasites from animals).
- b) Identification of ectoparasites in the laboratory and data processing.

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c) Statistical analysis and discussion of the results obtained.

Finally, this study aims to monitor, over the course of a three years, the evolution of cattle infestation by the various species of ticks found in the southern region of eastern Algeria (Setif), as well as the influence of farming type and altitude on this infestation.

Method

In region of stat of Setif (Algeria) (fig 1). During three years (2016-2018) a total of 2200 cattle were examined, of different breeds (Montbeliarde, Fleckvieh, Pie Noire Holstein, and the Improved Dairy Cattle breed (BLA) resulting from the crossbreeding of various breeds with Montbeliarde). The animals were selected by random draw with an identical distribution (1100 in the mountainous region and 1100 in the lowland region). Throughout the study period, the sample remained the same with no loss or replacement, and no acaricide treatment was applied to the cattle. The farms in the study area are not strictly for dairy farming but are mixed farms with both dairy cows and fattening calves. There are therefore two types of farming: a semi-extensive system for dairy cows where the animals' diet is primarily based on hay and concentrated feed in the buildings during winter and on pasture in the good season (spring and early summer); and an intensive system for fattening cattle. Parasites were removed twice a month between January and December (2016- 2018), All fixed were preserved in 70° ethanol until identification. We based on the adult identification keys (Bouattour, 2002; Estrada-Peña et al., 2004, 2017).

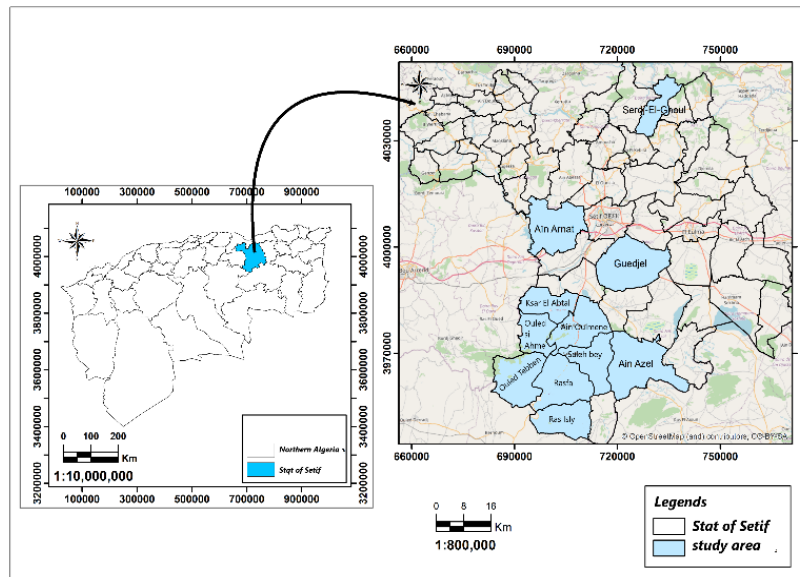


Figure 1. Geographic location of the study area

Statistical Analysis

Statistical analysis was carried out using the Chi-square test with SPSS 23 software (IBM Inc.). The data used in this study to determine the effect of altitude and type of rearing on tick infestation were based on a presence/absence criterion. Differences were considered significant at p values <0.05. Parasitological indicators were calculated according to Albert O & al (1997).

- Prevalence of tick infestation (%) = $100 \times$ (the number of hosts infected with one or more individuals of a particular parasite species divided by the total number of hosts examined for that parasite species).
- Infestation intensity = the number of individuals of a particular parasite species on a single infected host, i.e. the number of ticks/number of heads infested.
- Infestation abundance = the number of individuals of a particular parasite on a single host, whether or not the host is infected, i.e. the number of ticks/number of heads examined.

Results and Discussion

After examining the cattle, five species of insect (four species of phtiriosis and one of myiasis) and seven species of tick (Ixodidae) were identified. Our results indicate that the infestation rate was 66.09% (1454 cattle were infested by at least one ectoparasite).

Using the determination keys of Price & al. (2003) for mallophagous lice and Taylor & al. (2016) for anoplurids, we identified the following species: *Bovicola bovis*, *Haematopinus quadripertusus*, *Solenopotes capillatus* and *Linognathus vituli*. We also used James' key (1947) to identify myiasis (*Hypoderma lineatum*). The cattle were infested with hard ticks, and for the determination of these parasites, we took into consideration the morphological characteristics, namely: the rostrum, the legs, and the dorsal and ventral sides of the body, as well as sexual dimorphism. The species identified are: *Rhipicephalus turanicus*, *Rhipicephalus bursa*, *Boophilus annulatus*, *Hyalomma marginatum* *Hyalomma excavatum* and *Hyalomma scupense* and *Haemaphysalis sulcata*



H. marginatum



H. excavatum



H. scupense



Rh. turanicus



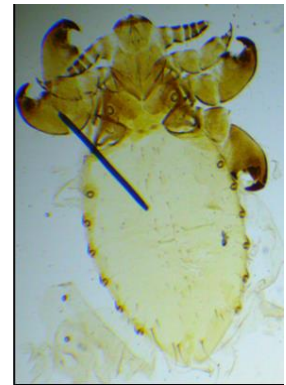
Rh. bursa



Hae sulcata



Linognathus vituli



Solenopotes capillatus



Haematopinus quadripertusus



Bovicola bovis



Hypoderma lineatum

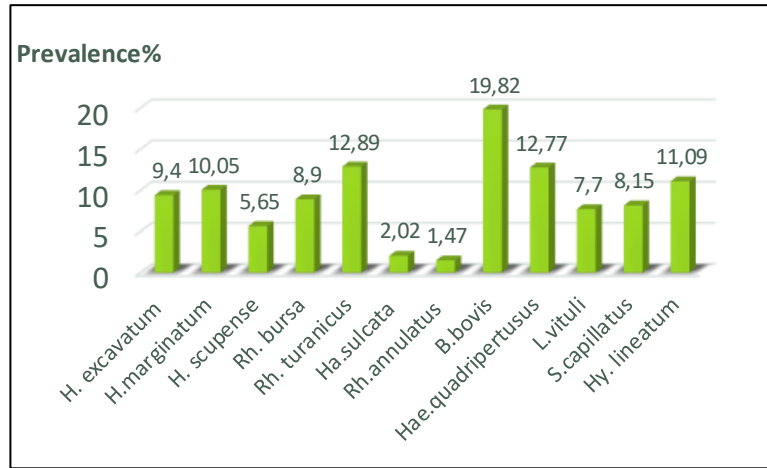


Figure 2. Prevalence of parasites

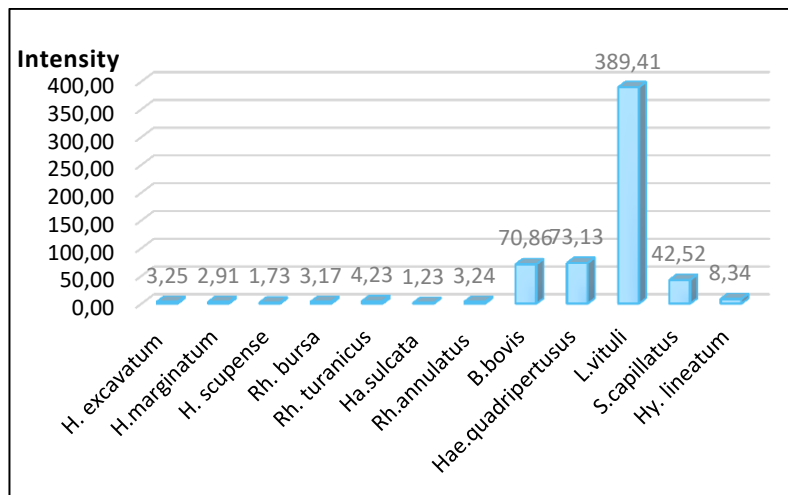


Figure 3. Intensity of parasites

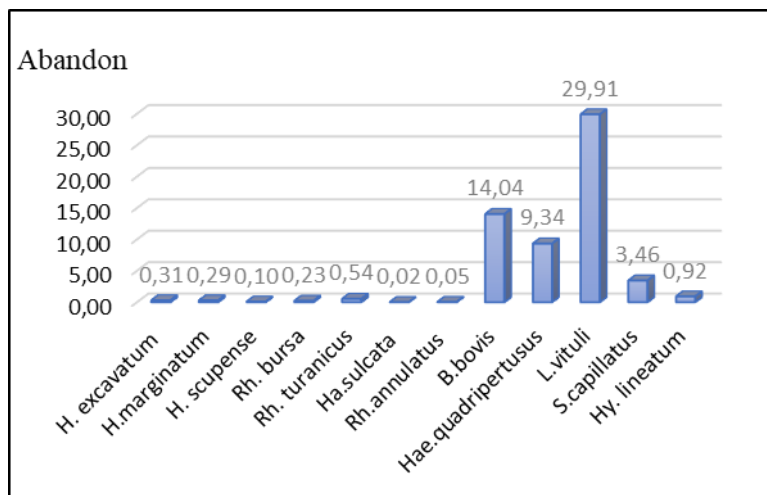


Figure 4. Prevalence of parasites

The total number of ticks collected shows a dominance of *Rhipicephalus turanicus*, followed by *Hyalomma marginatum*, then *Hyalomma excavatum* and *Rhipicephalus bursa* at the end, *Hyalomma scupense*, *Rhipicephalus (Boophilus) annulatus*, and *Haemaphysalis sulcata* have the lowest prevalence (Fig. 2). On the other hand, phthiriosis affected 783 cattle with a dominance of the mallophagan *Bovicola bovis*, followed by the anoplurans *Haematopinus quadripertusus*, *Solenopotes capillatus*, and *Linognathus vituli*. In contrast, only 244 cattle were affected by a single species myiasis (*Hypoderma lineatum*) with 2034 larvae.

Table 1. The statistical study of parasitic parameters

Factor	Ticks	Lice		myiasis		
	Prevalence %	Pv	Prevalence%	Pv	Prevalence %	Pv
Season		0.000		0		0.000
Autumn	26,63		29,4		7,5	
Summer	45,99		2,01		11,02	
Winter	0		56,5		3,7	
Spring	34,75		40,2		10,2	
Region		0.000		0,187		
Mountainous	30,6 %		31,8 %		8,1	0.297
Plaine	20 %		29,1 %		6,8	

Tab 1 shows that ectoparasites exhibit seasonal dynamics: seven species of ticks are active in spring and summer, while all four species of lice cause diseases primarily in winter. Hypodermosis, caused by *Hypoderma lineatum*, mostly occurs in spring and summer and can extend into autumn. The topographical region does not influence lice and hypodermosis occurrences but creates a favorable habitat for tick activity.

During our outings conducted over three years (2016-2018), *Rhipicephalus sp.* was the most abundant species. Moreover, its frequency was similar to that reported by Benchikh Elfegoun et al. (2013) and represented 47.6% of the collected ticks. Another study conducted by Boukabout (2003) showed that this genus is among the most abundant. We observed that the adults of the species *R. bursa* (vector of piroplasmosis), which is a monotropic species (Walker et al., 2014), are active in the summer while the immature stages are active in the cold season. Consequently, a peak was observed in April, where we found all three developmental stages present on multiple individuals at the same time. The species *R. turanicus*, a ditropic species, exhibits maximum activity between March and November; this species has been encountered in the semi-arid region of Mila (Benchikh Elfegoun et al., 2013), in the West (Yousfi-monod and Aeschlimann, 1996), and in (Boukabout, 2003), but with lower parasitic indices. This lower presence can be explained by the very high number of nymphs and larvae recorded on calves in the farms in September, which resulted in a second peak of infestation.

The species *R. annulatus (Boophilus)* (vector of bovine Babesioses) is a hydrophilic species commonly found in coastal regions with very high rainfall; its presence has been reported in the region of Tizi Ouzou (Abdul Hussain et al., 2004), in the Taher-Jijel region (Benchikh Elfegoun et al., 2007), and El Tarf (Benchikh Elfegoun et al., 2013) with very high prevalence rates of 79.96% and 77.08% respectively, compared to our result which is very low, at only 3.33%, aligning with similar findings in Mila (Benchikh Elfegoun et al., 2013) and Tiaret (Boukabout, 2003), both in semi-arid areas. However, this species is absent in Constantine (Benchikh Elfegoun et al., 2013). The low prevalence of this species is likely due to the dry climate effects in the region. The species *H. marginatum* and *H. excavatum* were present during the study period except during the cold months, from December to February. These two species are ditropic and have been found on cattle from March to November. Our results are similar to those of Boukabout (2003) and Benchikh Elfegoun et al. (2007 & 2013). Regarding the species *H. scupense*, it is an endophilic domestic tick of livestock, a two-host parasite, and other ungulates in the Maghreb region (Bouattour, 2002; Walker et al., 2014). This species transmits several pathogens, such as *Theileria annulata* (Ayadi, 2017), and various other pathogens are also transmitted by this species, including *Anaplasma phagocytophilum* and *Ehrlichia bovis* (Gharbi & Darghouth, 2014).

H. scupense is the least numerically representative species among the three belonging to this genus; however, this species was found in all three of its developmental stages. Larvae and nymphs were collected in October, and adults were present from March to September, peaking in October and absent in August. We note that the results obtained regarding the activity of this species are similar to those of Boukabout (2003) in Tiaret and Benchikh Elfegoun in Mila (2013). However, there is a notable difference between the prevalence obtained in our results (4.33%) and that of other authors, namely Benchikh Elfegoun et al. (2013), Boukabout (2003), and Laamari et al. (2012) with 13.6%, 28%, and 13.06% respectively.

Haemaphysalis sulcata is a species with a triphasic and polytropic life cycle (Estrada-Peña et al. 2004). It is characterized by a very low infestation rate (six individuals: three males and three females). Immature ticks mainly attach to reptiles such as lizards and adults to ungulates, but also to dogs (Estrada-Peña et al., 2004). Adults are active in autumn and winter from October to March. Nymphs and larvae are active in spring and summer. This low prevalence indicates occasional parasitism for this species. Our results are similar to those of Laamri et al. (2012) in Morocco.

The infestation depends on the study area: ticks are more numerous in mountainous regions. A similar observation was made during the study of the effect of altitude on tick dynamics in the Annaba region (Belabed et al., 2015) and in Constantine, where the authors Benchikh Elfegoune et al. (2019) demonstrated that altitude influences tick activity, more specifically the impact of vegetation presence and soil nature on the tick life cycle.

Conclusion

The results of our work aimed to provide an overview of the ectoparasite species of cattle during the period from January 2016 to December 2017 in the southern zone of the Wilaya of Setif, characterized by a semi-arid climate. This goal also highlighted the effect of risk factors, whether intrinsic (such as breed, sex, age) or extrinsic (such as season, type of breeding, and topography of the region), which are involved in the prevalence, abundance, and diversity of various parasites. The four species of lice exhibited seasonal activity. They caused winter infections with a peak in January. The topography of the study areas has no influence on lice infestation. It appears that the seven species of ticks have a seasonal dynamic, with activity in spring and summer. We observed that the topography of the study area created a favorable biotope for tick activity.

Recommendations

Note that the presence of these parasites on cattle is likely to create stress that could play a significant role in their well-being, production and their reproduction. In the end, we recommend further studies on the immunity status of cattle against parasitic diseases, in order to precisely determine the parasitic loads necessary for its maintenance.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS Journal belongs to the author.

Acknowledgements or Notes

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