Population dynamics of ticks infesting sheep in the arid steppes of Tunisia

Khawla Elati[1]* Ayet Allah Ayadi[1] Médiha Khamassi Khbou[2]
Mohamed Jdidi[1] Mourad Rekik[3] Mohamed Gharbi[1]

Keywords

Sheep, Metastigmata, *Rhipicephalus sanguineus sensu lato*, *Hyalomma excavatum*, population dynamics, Tunisia

Submitted: 1 April 2017
Accepted: 29 August 2018
Published: 29 October 2018
DOI: 10.19182/remvt.31641

Summary

This study aimed to determine tick population dynamics infesting sheep in Gafsa region (Central Tunisia). Ticks were collected monthly over a year, from October 2013 to September 2014, from 57–64 randomly-included Barbarine-breed sheep. In total, 560 ticks were collected and identified. They belonged to two species: *Rhipicephalus sanguineus sensu lato* (98.6%) and *Hyalomma excavatum* (1.4%). Sheep were only infested from April to October with a maximum infestation prevalence (number of infested animals / number of examined animals) in August for *R. sanguineus* s.l. (83%), and in May for *H. excavatum* (7%). The highest infestation intensity (number of ticks / number of infested sheep) was 3.7 ticks per animal in August. These results should help sheep owners and veterinarians to implement efficient control programs against ticks and the pathogens they transmit.

■ How to quote this article: Elati K., Ayadi A.A., Khamassi Khbou M., Jdidi M., Rekik M., Gharbi M., 2018. Population dynamics of ticks infesting sheep in the arid steppes of Tunisia. *Rev. Elev. Med. Vet. Pays Trop*., **71** (3): xxx, doi: 10.19182/remvt.31641

■ INTRODUCTION

Agriculture and most particularly extensive livestock production are vital for the livelihood of small landholders on the Southern Mediterranean shore. Sheep breeding is a major breeding activity in Tunisia. Its development is threatened by numerous constraints such as diseases, in particular tick-borne diseases. Ticks can cause hypersensitivity, inflammation and anemia impairing animal productivity. They also transmit several pathogens (parasites, bacteria and viruses), that can result in a high cost from loss of infected animals (Gharbi and Darghouth, 2014). In Tunisia, several of these ticks transmit pathogens to sheep with various prevalence and veterinary importance: *Theileria ovis* (Rjeibi et al., 2014), *Theileria lestoquardi* (Rjeibi et al., 2016b), *Babesia ovis* (Rjeibi et al., 2014) and *Anaplasma ovis* (Ben Said et al., 2015).

Climate change is an important emerging risk factor affecting agriculture, human and livestock health (Keleman Saxena et al., 2016). This is particularly true in North Africa considered as a “hot spot for climate change” (Giorgi, 2006). Increases in temperature cause heat stress in livestock species, hence provoking reductions in growth rate, milk yield and reproductive performance (Das et al., 2016). Furthermore, these changes affect the spread and abundance of several vector arthropods such as ticks, mosquitoes and flies, leading to a modified transmission of several pathogens (Elbers et al., 2015). The proliferation of vector ticks caused by the temperature increase promotes the emergence of various diseases such as Crimean-Congo hemorrhagic fever (Leblebicioglu et al., 2015). More precisely, increases in temperature might on one hand provide a suitable environment for the spread of thermophilic tick species such as *Hyalomma marginatum* and *Rhipicephalus annulatus* (Domșa et al., 2016), and, on the other hand, result in the population decrease of species which prefer more temperate conditions, e.g. *Ixodes ricinus*.

Under such epidemiological and changing climate conditions, the study of tick infestation dynamics in sheep is crucial. The implementation of any tick control and, subsequently, tick-borne pathogen control programs cannot succeed if no specific data are available regarding the seasonal prevalence and local phenology of the tick species concerned. This study reports, for the first time to our knowledge, tick infestation dynamics in sheep in arid Tunisian steppes.

1. Laboratoire de parasitologie, Univ. Manouba, Institution de la recherche et de l’enseignement supérieur agricoles, Ecole nationale de médecine vétérinaire de Sidi Thabet, 2020 Sidi Thabet, Tunisie.
2. Laboratoire de maladies contagieuses-zoonoses, législation sanitaire, Univ. Manouba, Institution de la recherche et de l’enseignement supérieur agricoles, Ecole nationale de médecine vétérinaire de Sidi Thabet, 2020 Sidi Thabet, Tunisie.
3. International Center for Agricultural Research in the Dry Areas (ICARDA), Amman 11195, Jordan.

* Corresponding author
Tel.: +216 71 552 200; Fax: +216 71 552 441; Email: elati.khawla@gmail.com

■ MATERIALS AND METHODS

The current survey was carried out in Sned locality, Gafsa District (34° 25' N, 8° 47' E; mean altitude 313 meters) (Figure 1). The locality is typical of the arid steppes of Central Tunisia with a maximum annual rainfall of 200 millimeters. In this region, the dry period extends from April to September and temperatures can reach a maximum of 49°C in summer. The mean minimum temperature is recorded in January and February (0°C).

Each month, a sample of 57–64 sheep, randomly chosen within a flock comprising 400 animals, were included in the survey. Selected animals were classified as young (less than one year old) or adult (over a year old). The sheep grazed during the day on natural pastures and were kept under a semi-intensive breeding system. Ewes were supplemented before mating, at the end of pregnancy and during early suckling. Males were kept in barns during the low grazing period. Animals were treated against ectoparasites with a diazinon formulation at 2.5‰ once a year (in May).

The sheep were monitored for one year, from October 2013 to September 2014. All surveyed sheep were thoroughly examined and ticks were collected in labeled flasks containing 70% ethanol and 10% glycerine. They were then identified according to Walker et al. (2003). Because of morphological similarities between *Rhipicephalus sanguineus* and *R. turanicus,* these two species were pooled in the *R. sanguineus sensu lato* (s.l.) group (Nava et al., 2015; Hekimoğlu et al., 2016). Results were expressed using two parasitological indicators (Margolis et al., 1982):

Infestation prevalence (%) = 100 × (num. of infested sheep / num. of examined sheep)

Tick infestation intensity = num. of ticks / num. of infested sheep

To compare infestation prevalence between age groups, gender and months, chi-square tests were performed with Epi-Info software (Dean et al., 2011). Comparison of tick infestation means were carried out with Student t test. Results were considered significant at 5% threshold.

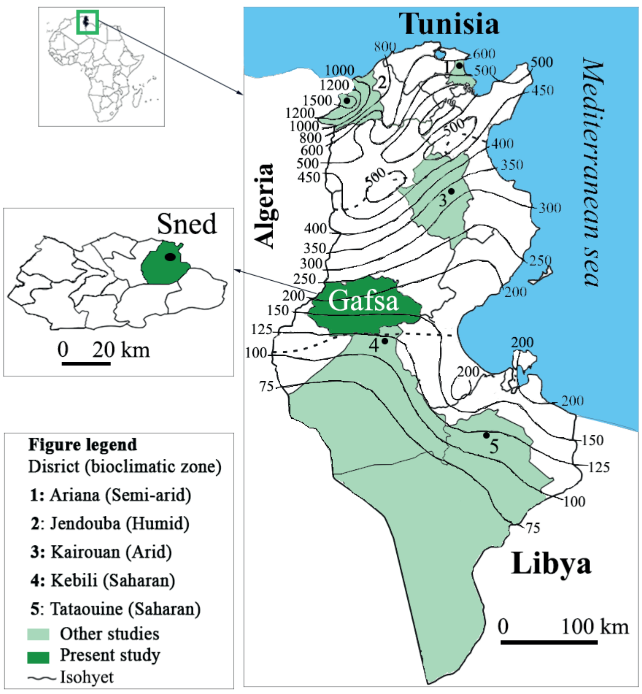

Figure 1 : *Geographical localization of Sned locality, Gafsa District (studied area) and other regions where previous studies on ticks were carried out.*

■ RESULTS

No tick infestation was observed between November and March, whereas the infestation prevalence was maximal in August (83%). The overall maximum infestation intensity (3.7) was also observed in August (Table I).

Except in July, the infestation prevalence of female sheep was significantly higher than that of males ($p = 0.05$). There was no significant difference between the infestation prevalence according to age group, although a higher infestation prevalence was observed in young sheep in April, August and September, and in adults in May, June, July and October ($p = 0.6$). No significant differences were observed between infestation intensities from April to September according to the age group ($p = 0.16$).

Two tick species were collected: *R. sanguineus* s.l. (n = 552; 98.6%) and *Hyalomma excavatum* (n = 8; 1.4%). *Rhipicephalus* ticks were all attached to the ears, whereas *Hyalomma* ticks were mainly collected from the sternum (6/8). The activity peak of *R. sanguineus* s.l. was in August (83%). The few *H. excavatum* were collected only in May (7%), June and September (Table I). There were more female (56.7%; n = 313) than male *R. sanguineus* s.l. (43.3%; n = 239) ($p < 0.001$) (sex ratio M:F = 0.76). The same trend was observed for *H. excavatum* ticks (three male and five female ticks).

■ DISCUSSION

Two species were identified in the study: *R. sanguineus* s.l. and *H. excavatum*. In a similar survey, Rjeibi et al. (2015) showed the presence of five tick species in five districts of Tunisia (Jendouba, Ariana, Kairouan, Kebili and Tataouine) in different bioclimatic zones (humid, semiarid, arid and Saharan) (Figure 1): *R. turanicus* (45%), *H. excavatum* (41.8%) and *R. sanguineus* (4.6%) were present in all studied areas; *H. dromedarii* (7.8%) was collected in Tataouine District, and *R. camicasi* (0.7%) in Kebili District. Another survey carried out by Rjeibi et al. (2016b) in Kebili District, close to the location of the present study, revealed that *H. excavatum* was the most frequent tick in sheep, followed by *Rhipicephalus* spp. The variability among tick populations parasitizing sheep in different Tunisian areas may be related to both abiotic and biotic factors, i.e. the management systems, nature of pastures, cohabitation with other tick-host species (such as dromedaries in the South), and to the introduction of infested animals from other Tunisian regions and neighboring countries (Libya and Algeria). Climate conditions vary a lot from North (humid and subhumid) to South Tunisia (arid and Saharan). Several works show that some tick species are not adapted to the arid climate, e.g. *Ixodes* ticks; climate change could therefore lead to their disappearance and the appearance of other tick species (Estrada-Peña et al., 2013; Domșa, et al., 2016).

H. excavatum may be a two- or three-host tick. It is mainly present in Central and Southern Tunisia (Bouattour et al., 1999; Rjeibi et al., 2015; Rjeibi et al., 2016a) and transmits *Theileria lestoquardi* that has been reported in Kebili District (Rjeibi et al., 2016b). *R. sanguineus* s.l. is a three-host summer tick (Bouattour et al., 1999). *R. turanicus* is the most common sheep tick (Walker et al., 2003; Estrada-Peña et al., 2004). However, as in the present study, *R. sanguineus* has been reported as the most frequent tick species in sheep in North Central Spain (Estrada-Peña et al., 2004). On the other hand, Bouhous et al. (2011) mainly collected *Hyalomma impeltatum* (75.2%) from sheep in Algeria, to a lesser extent *R. sanguineus* (19.4%), and a few specimens of *H. marginatum, H. dromedarii, H. scupense, R. guilhoni* and *R. evertsi*.

In the present study, the maximum infestation prevalence was recorded in August: any control program should thus be applied

Table I

Monthly infestation indicators of sheep according to age and gender and monthly population dynamics of ticks according to their species in Tunisia

Indicators		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Num. infested sheep / num. examined sheep (prevalence % and precision)	Male	0/26	0/26	0/26	0/26	0/26	0/26	0/6	0/3	5/10 (50 ± 31)	3/4 (75 ± 42)	1/6 (17 ± 30)	1/6 (17±30)
	Female	3/38 (8 ± 9)	0/38	0/38	0/38	0/38	0/38	13/55 (24 ± 11)	27/58 (47 ± 13)	36/51 (71 ± 13)	36/55 (65 ± 13)	47/52 (90 ± 8)	37/51 (73 ± 12)
	Young	0/38	0/38	0/38	0/38	0/38	0/38	6/23 (26 ± 18)	12/29 (41 ± 18)	18/32 (56 ± 17)	12/23 (52 ± 20)	21/23 (91 ± 12)	17/23 (74 ± 18)
	Adult	3/26 (12 ± 12)	0/26	0/26	0/26	0/26	0/26	7/38 (18 ± 12)	15/32 (47 ± 17)	23/29 (79 ± 15)	27/36 (75 ± 14)	27/35 (77 ± 14)	21/34 (62 ± 16)
	Overall	3/64 (5 ± 5)	0/64	0/64	0/64	0/64	0/64	13/61 (21 ± 10)	27/61 (44 ± 12)	41/61 (67 ± 12)	39/59 (66 ± 12)	48/58 (83 ± 10)	38/57 (67 ± 12)
Infestation intensity (num. ticks / num. infested sheep)	Male	0	0	0	0	0	0	0	0	4 (20/5)	4 (12/3)	1 (1/1)	1 (1/1)
	Female	1.3 (4/3)	0	0	0	0	0	1.5 (19/13)	1.7 (45/27)	2.6 (93/36)	2.5 (90/36)	3.8 (178/47)	2.6 (97/37)
	Young	0	0	0	0	0	0	1.7 (10/6)	1.6 (19/12)	2.7 (48/18)	2.5 (30/12)	3.2 (68/21)	2.2 (37/17)
	Adult	1.3 (4/3)	0	0	0	0	0	1.3 (9/7)	1.7 (26/15)	2.8 (65/23)	2.7 (72/27)	4.1 (111/27)	2.9 (61/21)
	Overall	1.3 (4/3)	0	0	0	0	0	1.5 (19/13)	1.7 (45/27)	2.8 (113/41)	2.6 (102/39)	3.7 (179/48)	2.6 (98/38)
Total tick number	*R. s.*	4	0	0	0	0	0	19	39	112	102	179	97
	H. e.	0	0	0	0	0	0	0	6	1	0	0	1
Tick infestation prevalence = 100 x (num. sheep infested by tick sp. / num. examined sheep)	*R. s.*	3/64 (5 ± 5)	0	0	0	0	0	13/61 (21 ± 5)	27/61 (44 ± 12)	41/61 (67 ± 12)	39/59 (66 ± 12)	48/58 (83 ± 10)	38/57 (67 ± 12)
	H. e.	0	0	0	0	0	0	0	4/61 (7 ± 6)	1/61 (2 ± 3)	0	0	1/57 (2 ± 3)

R. s.: Rhipicephalus sanguineus sensu lato; H. e: Hyalomma excavatum

during this period. The tick infestation started in April and no infestation was observed during the cold months (from November to March) since the ticks were not active. Infestation onset is associated with the increase in temperature and photoperiod that promote the development and activity of ticks (Dantas-Torres and Otranto, 2013). Global warming projections for the study area show that infestations in the future may start much earlier in spring and/or late winter, which would extend the tick activity period.

There was no significant difference between the infestation prevalence in adult and young sheep, both groups being alternately most infested, which could be due to the monthly fluctuation of the examined sample. This aleatory difference was unexpected because lambs are at first monogastric and do not graze, and thus release lower quantities of attractive gases for ticks (Bouattour et al., 1996). They should thus be less infested than adults. Rjeibi et al. (2016b) also observed no difference in the infestation prevalence between different age groups, which could be because, in North Tunisia where pastures are very rich, young sheep graze with adults. In Gafsa District, where our study was carried out, the management system was different: young sheep grazed near the farms with adults for a short period and were kept mostly inside.

Although the number of examined males was often, by far, lower than that of females, the results revealed that adult female sheep (except in July) were more at risk than males, which were only infested between June and September. The difference may be due to the fact that males were often kept in the farm and had fewer grazing periods than females, as they were used for mating or fattening. Moreover, females expressed immunodepression during pregnancy and lactation (Rehman et al., 2017).

The number of female ticks was higher than that of male for both *R. sanguineus* s.l. and *H. excavatum*, but it was not significant for the latter. Usually, the number of male ticks is higher because they spend a longer period attached to the animals, whereas female ticks engorge in more or less one week. This unusual observation could not be elucidated.

The identification of attachment sites increases the efficiency of tick control, whether it is by tick removal or acaricide application (Gharbi et al., 2013; Gharbi and Darghouth, 2014). A common attachment site for *Rhipicephalus* ticks was near the ear tag, which is consistent with the fact that questing *Rhipicephalus* ticks attach when sheep are head-down grazing. On the other hand, *H. excavatum* was mainly collected from the sternum. In Iran, Loui Monfared et al. (2015) showed that 42% of sheep ticks (comprising 42.2% of *R. bursa* and 17.3% of *R. sanguineus*) were present on the head, 30% on the tail and in anal region, 18% on the udder, 8% on the groin, and 2% elsewhere. In Iraq, 85% of ticks (mainly *R. bursa*) were observed on the ears, 9.8% on the udder and 5.1% on the hind legs and around the eyes (Omer et al., 2007). The preferential attachment sites are thus humid, warm, not accessible to grooming and with richly vascularized thin skin. However, these sites vary according to the species present in the area: farmers have thus to adapt their tick control practices.

■ CONCLUSION

Further studies are needed to determine the direct effect of ticks on sheep health and the pathogens they transmit to them. Studying tick species, their preferential hosts and phenology enables veterinary services to make recommendations to farmers that help them choose the suitable control period, thus reducing expenses for acaricides. In light of our results, we recommend the use of acaricides on the heads of sheep between April and October to eradicate the majority of tick populations.

Acknowledgments

This study was funded by the 'Laboratoire d'épidémiologie des infections enzootiques des herbivores en Tunisie : application à la lutte' (ministère de l'Enseignement supérieur et de la Recherche scientifique, Tunisie). The authors thank Messrs. Bechir Guesmi, Mokhtar Dhibi and Taoufik Lahmar for their support, and the sheep farmer who agreed to let them handle his animals.

REFERENCES

Ben Said M., Belkahia H., Alberti A., Zobba R., Bousrih M., Yahiaoui M., Daaloul-Jedidi M., et al., 2015. Molecular survey of *Anaplasma* species in small ruminants reveals the presence of novel strains closely related to *A. phagocytophilum* in Tunisia. *Vector Borne Zoonotic Dis.*, **15** (10): 580-590, doi: 10.1089/vbz.2015.1796

Bouattour A., Darghouth M.A., Ben Miled L., 1996. Cattle infestation by *Hyalomma* ticks and prevalence of *Theileria* in *H. detritum* species in Tunisia. *Vet. Parasitol.,* **65** (3-4): 233-245, doi: 10.1016/S0304-4017(96)00951-X

Bouattour A., Darghouth M.A., Daoud A., 1999. Distribution and ecology of ticks (Acari: Ixodidae) infesting livestock in Tunisia: an overview of eight years field collections. *Parassitologia,* **41** (suppl. 1): 5-10

Bouhous A., Aissi M., Harhoura K., 2011. Prevalence of Ixodidae in sheep brought for slaughter in Adrar municipal abattoir, Southwest Algeria. *Sci. Parasitol.*, **12** (4): 197-201

Dantas-Torres F., Otranto D., 2013. Species diversity and abundance of ticks in three habitats in Southern Italy. *Ticks Tick Borne Dis.*, **4** (3): 251-255, doi: 10.1016/j.ttbdis.2012.11.004

Das R., Sailo L., Verma N., Bharti P., Saikia J., Imtiwati, Kumar R., 2016. Impact of heat stress on health and performance of dairy animals: A review. *Vet. World,* **9** (3): 260-268, doi: 10.14202/vetworld.2016.260-268

Dean A.G., Arner T.G., Sunki G.G., Friedman R., Lantinga M., Sangam S., Zubieta J.C., et al., 2011. Epi Info, a database and statistics program for public health professionals. CDC, Atlanta, GA, USA

Domşa C., Sándor A.D., Mihalca A.D., 2016. Climate change and species distribution: possible scenarios for thermophilic ticks in Romania. *Geospat. Health,* **11** (2), 421, doi: 10.4081/gh.2016.421

Elbers A.R.W., Koenraadt C.J.M., Meiswinkel R., 2015. Mosquitoes and *Culicoides* biting midges: vector range and the influence of climate change. *Rev. Sci. Tech. Off. Int. Epizoot.*, **34** (1): 123-137

Estrada-Peña A., Farkas R., Jaenson T.G.T., Koenen F., Madder M., Pascucci I., Salman M., et al., 2013. Association of environmental traits with the geographic ranges of ticks (Acari: Ixodidae) of medical and veterinary importance in the western Palearctic. A digital data set. *Exp. Appl. Acarol.* **59** (3): 351-366, doi: 10.1007/s10493-012-9600-7

Estrada-Peña A., Quíez J., Sánchez Acedo C., 2004. Species composition, distribution, and ecological preferences of the ticks of grazing sheep in north-central Spain. *Med. Vet. Entomol.*, **18** (2): 123-133, doi: 10.1111/j.0269-283X.2004.00486.x

Gharbi M., Darghouth M.A., 2014. A review of *Hyalomma scupense* (Acari, Ixodidae) in the Maghreb region: from biology to control. *Parasite,* **21**, 2, doi: 10.1051/parasite/2014002

Gharbi M., Hayouni M.E., Sassi L., Dridi W., Darghouth M.A., 2013. *Hyalomma scupense* (Acari, Ixodidae) in northeast Tunisia: seasonal population dynamics of nymphs and adults on field cattle. *Parasite,* **20**, 12, doi: 10.1051/parasite/2013012

Giorgi F., 2006. Climate change hot-spots. *Geophys. Res. Lett.*, **33** (8), L08707, doi: 10.1029/2006GL025734

Hekimoğlu O., Sağlam İ.K., Özer N., Estrada-Peña A., 2016. New molecular data shed light on the global phylogeny and species limits of the *Rhipicephalus sanguineus* complex. *Ticks Tick Borne Dis.*, **7** (5): 798-807, doi: 10.1016/j.ttbdis.2016.03.014

Keleman Saxena A., Cadima Fuentes X., Gonzales Herbas R., Humphries D.L., 2016. Indigenous food systems and climate change: Impacts of climatic shifts on the production and processing of native and traditional crops in the Bolivian Andes. *Front. Publ. Health*, **4**, 20, doi: 10.3389/fpubh.2016.00020

Leblebicioglu H., Ozaras R., Erciyas-Yavuz K., 2015. Emergence of Crimean-Congo hemorrhagic fever. *Trans. R. Soc. Trop. Med. Hyg.,* **109** (11): 676-678, doi: 10.1093/trstmh/trv083

Loui Monfared A., Mahmoodi M., Fattahi R., 2015. Prevalence of ixodid ticks on cattle, sheep and goats in Ilam province, Iran. *J. Parasit. Dis.,* **39** (1): 37-40, doi: 10.1007/s12639-013-0267-8

Margolis L., Esch G.W., Holmes J.C., Kuris A.M., Schad G.A., 1982. The use of ecological terms in parasitology (Report of an ad hoc committee of the American society of parasitologists). *J. Parasitol.*, **68** (1): 131-133, doi: 10.2307/3281335

Nava S., Estrada-Peña A., Petney T., Beati L., Labruna M.B., Szabó M.P.J., Venzal J.M., et al., 2015. The taxonomic status of *Rhipicephalus sanguineus* (Latreille, 1806). *Vet. Parasitol.*, **208** (1-2): 2-8, doi: 10.1016/j.vetpar.2014.12.021

Omer L.T., Kadir M.A.A., Seitzer U., Ahmed J.S., 2007. A survey of ticks (Acari: Ixodidae) on cattle, sheep and goats in the Dohuk governorate, Iraq. *Parasitol. Res.,* **101** (suppl. 2): 179-181

Rehman A., Nijhof A.M., Sauter-Louis C., Schauer B., Staubach C., Conraths F.J., 2017. Distribution of ticks infesting ruminants and risk factors associated with high tick prevalence in livestock farms in the semi-arid and arid agro-ecological zones of Pakistan. *Parasit. Vectors*, **10**, 190, doi: 10.1186/s13071-017-2138-0

Rjeibi M.R., Darghouth M.A., Gharbi M., 2016a. Prevalence of *Theileria* and *Babesia* species in Tunisian sheep. *Onderstepoort J. Vet. Res.,* **83** (1):1-6, doi: 10.4102/ojvr.v83i1.1040

Rjeibi M.R., Gharbi M., Mhadhbi M., Mabrouk W., Ayari B., Nasfi I., Jedidi M., et al., 2014. Prevalence of piroplasms in small ruminants in North-West Tunisia and the first genetic characterisation of *Babesia ovis* in Africa. *Parasite*, **21**, 23, doi: 10.1051/parasite/2014025

Rjeibi M.R., Darghouth M.A., Omri H., Souidi K., Rekik M., Gharbi M., 2015. First molecular isolation of *Mycoplasma ovis* from small ruminants in North Africa. *Onderstepoort J. Vet. Res.*, **82** (1), 912, doi: 10.4102/ojvr.v82i1.912

Rjeibi M.R., Darghouth M.A., Rekik M., Amor B., Sassi L., Gharbi M., 2016b. First molecular identification and genetic characterization of *Theileria lestoquardi* in sheep of the Maghreb region. *Transbound. Emerg. Dis.*, **63** (3): 278-284, doi: 10.1111/tbed.12271

Walker A.R., Bouattour A., Camicas J.L., Estrada-Peña A., Horak I.G., Latif A.A., Pegram R.G., et al., 2003. Ticks of domestic animals in Africa: a guide to identification of species. Bioscience Reports, Edinburgh, UK, 221 p.

Résumé

Elati K., Ayadi A.A., Khamassi Khbou M., Jdidi M., Rekik M., Gharbi M. Dynamique des populations de tiques infestant les ovins dans les steppes arides de Tunisie

Cette étude a cherché à déterminer la dynamique des populations de tiques infestant les ovins dans la région de Gafsa (centre de la Tunisie). Les tiques ont été prélevées sur 57–64 moutons de race Barbarine choisis au hasard chaque mois pendant un an, d'octobre 2013 à septembre 2014. Au total, 560 tiques ont été collectées et identifiées. Elles appartenaient à deux espèces : *Rhipicephalus sanguineus sensu lato* (98,6 %) et *Hyalomma excavatum* (1,4 %). Les ovins n'ont été infestés que d'avril à octobre avec une prévalence maximale (nombre d'animaux infestés / nombre d'animaux examinés) en août pour *R. sanguineus* s.l. (83 %) et en mai pour *H. excavatum* (7 %). L'intensité d'infestation maximale (nombre de tiques / nombre d'animaux infestés) a été de 3,7 tiques par animal en août. Ces données seront très utiles pour les éleveurs d'ovins et les vétérinaires pour mettre en place des mesures de lutte efficaces contre les tiques et les pathogènes qu'elles transmettent.

Mots-clés : ovin, Metastigmata, *Rhipicephalus sanguineus sensu lato*, *Hyalomma excavatum*, dynamique des populations, Tunisie

Resumen

Elati K., Ayadi A.A., Khamassi Khbou M., Jdidi M., Rekik M., Gharbi M. Dinámica poblacional de garrapatas que infestan ovejas en las estepas áridas de Túnez

Este estudio tuvo como objetivo determinar la dinámica de la población de garrapatas que infestan a las ovejas en la región de Gafsa (Túnez Central). Se recolectaron mensualmente garrapatas al azar de 57–64 ovejas de raza Barbarina. Los animales fueron monitoreados por un período de un año, desde octubre de 2013 hasta septiembre de 2014. Se recolectaron e identificaron 560 garrapatas. Las garrapatas pertenecieron a dos especies: *Rhipicephalus sanguineus sensu lato* (98,6%) y *Hyalomma excavatum* (1,4%). Las ovejas sólo se infestaron de abril a octubre con una prevalencia máxima de infestación (número de animales infestados / número de animales examinados) en agosto para *R. sanguineus* s.l. (83%), y en mayo para *H. excavatum* (7%). La mayor intensidad de infestación (número de garrapatas / número de ovejas infestadas) fue de 3,7 en agosto. Estos resultados deberían ayudar a los propietarios de ovejas y veterinarios a implementar programas de control eficientes contra las garrapatas y los patógenos que transmiten.

Palabras clave: ovino, Metastigmata, *Rhipicephalus sanguineus sensu lato*, *Hyalomma excavatum*, dinámica de poblaciones, Túnez