

## Population dynamics of ticks infesting horses in north-west Tunisia

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### Summary

A preliminary study was carried out to examine the population dynamics of ticks on 24 pure Arabian horses. The horses were monitored monthly over one year in the Ghardimaou region of north-west Tunisia. A total of 120 adult ticks were collected and identified, leading to the estimation of different parasitological indicators. The ticks belonged to a single genus (*Hyalomma*) and three species: *H. scupense* (59%), *H. marginatum* (28%) and *H. excavatum* (13%) ( $p < 0.001$ ). The mean infestation prevalence was 29.5%; the highest prevalence was observed for *H. scupense* (41.7%) ( $p < 0.05$ ). The mean overall intensity of infestation was 0.3 ticks/horse. The highest mean intensity was observed with *H. scupense* (0.6 ticks/horse) and the highest individual intensity measurement was observed for *H. scupense* (1.1 ticks/animal). The mean annual abundance of ticks was 0.1 ticks/animal. There was no significant correlation between a horse's age and the number of ticks ( $p > 0.05$ ), but the proportion of the ticks on mares was significantly higher than that on males: 65.0% and 35.0%, respectively ( $p < 0.05$ ). To the authors' knowledge this is the first longitudinal study of tick dynamics in North African horses.

### Keywords

Horse – *Hyalomma* sp. – Population dynamics – Tick – Tunisia.

## Introduction

Horses are subject to various health problems, including those due to tick infestations. Ticks cause both direct (wounds, inflammation and anaemia) and indirect effects (tick-borne infections). Infections caused by tick-borne pathogens such as *Babesia caballi*, *Theileria equi*, *Borrelia burgdorferi* and *Anaplasma phagocytophilum* are frequent in horses (1, 2). In endemic areas such as Tunisia, many of these infections are subclinical: they may lead to a decrease of a horse's performance without inducing any clinical signs. Given that such diseases are often not clinically expressed, the prevalence of infection may be underestimated by both horse owners and veterinarians (3). Many horse owners attempt to control tick infestation, because this is the best control option for tick-borne pathogens in horses, but it is very difficult in countries, such as Tunisia, where no acaricides approved for horses are available. Horse owners are often reluctant to leave their animals unprotected throughout the year; this is particularly true for owners of purebred horses with a high market value.

Despite their increasing importance in equine pathology, studies of the dynamics of tick infestation of horses are scarce. Published surveys of horse ticks have involved cross-sectional observations (4) or a limited time period (when the ticks are thought to be active on horses) (5). The first longitudinal survey on the infestation dynamics of ticks on horses in North Africa is presented in this report. The aim of this study was to explore the phenology of ticks on an Arabian purebred horse farm in order to provide the veterinary practitioner with important epidemiological data.

## Materials and methods

### Study region

This work was carried out from March 2011 to February 2012 in Ghardimaou (Jendouba governorate) (36°27'N, 8°26'E). This locality is situated at a mean altitude of 200 m, near the border with Algeria, and is in north-west Tunisia 192 km from Tunis, the capital. The

locality of Ghardimaou is situated in the humid bioclimatic stratus: the mean annual rainfall is 1,000 mm, and the temperature varies between 5 and 10°C in winter and 25 and 30°C in summer.

### Horses studied

A total of 24 (sex ratio = 1) purebred Arabian horses, aged between 6 and 32 years (mean age: 14.3; standard deviation 5.9) and belonging to one farm were included in the survey. The horses were fed milled barley, alfalfa and vetch. Male and female horses were pastured in two separate groups throughout the day and were housed in individual boxes during the night. In order to avoid interference with the survey, the horses' owner was asked not to use any acaricide treatment.

Each month, between March 2011 and February 2012, the whole body of each horse was inspected for the presence of ticks; the ticks were collected and stored in flasks containing 70% ethanol. At the laboratory, the ticks were identified according to the key of Walker *et al.* (6).

The following epidemiological indicators were used (7):

- Prevalence of tick infestation (%) =  $100 \times \text{number of horses infested by ticks} / \text{number of horses examined}$
- Infestation intensity =  $\text{Number of ticks} / \text{number of horses infested}$
- Infestation abundance =  $\text{Number of ticks} / \text{number of horses examined}$ .

A chi-squared analysis was performed with a threshold of 5% (8).

## Results and discussion

### Infestation indicators

A total of 120 adult ticks were collected from the horses; they belonged to one genus and three species: *H. marginatum*, *H. excavatum* and *H. scupense*. All of them transmit *Theileria equi*

and *Babesia caballi* except *H. scupense*, which transmits only *T. equi* (2). The collected tick population consisted of 73 male (60%) and 47 female ticks (40%) (sex ratio M:F = 1.55). A similar trend was reported in *Hyalomma* spp. ticks collected from dromedaries (9), *Hyalomma aegyptium* from turtles (10) and *Hyalomma scupense* from cattle (11). Indeed, the lifespan of male ticks is longer than that of females, and the former are able to move from one animal host to another (12).

No immature *H. scupense* ticks were observed on the horses; this may have been due to the low number of these ticks found. The number of ticks collected is probably an underestimate because the horses were examined only once every month and, consequently, between the two visits some ticks could have attached, become engorged and left their host. The mean prevalence of tick infestation was 29.5%, and the highest infestation prevalence was observed for *H. scupense* (41.7%). All the collected ticks belonged to the genus *Hyalomma*; the highest number of ticks was recorded for *H. scupense* ( $n = 71$ ; 59.2%), followed by *H. marginatum* ( $n = 34$ ; 28.3%) and *H. excavatum* ( $n = 15$ ; 12.5%) ( $p < 0.001$ ). In the same region, in a cross-sectional study carried out by M'ghirbi *et al.* (1), the mean infestation prevalence among 60 horses was 18%. In that study, three tick species were collected during April and June: *Hyalomma marginatum* (144 males and 72 females), *H. excavatum* (17 males and 2 females) and *Rhipicephalus bursa* (4 males and 4 females).

The mean infestation intensity of horses in the present study was low (0.3 ticks/animal); the maximum was 1.1 ticks/animal (Table I). There was no significant correlation between the age of the horse and the number of ticks ( $p > 0.05$ ). However, the proportion of the ticks on mares was significantly higher than that on males: 65.0% and 35.0%, respectively ( $p < 0.05$ ). A similar trend was reported by Gharbi *et al.* in cattle infested by *H. scupense* (11).

Insert Table I here

## Tick infestation dynamics

Tick activity was unimodal, with peak prevalence during May (66.7%). The mean prevalence of tick infestation (during the 12 months of the survey) was 29.5%. No ticks were collected during January and February (the winter season) (Fig. 1). The peak of activity for the three tick species was observed during the spring: *H. excavatum* and *H. scupense* showed peaks in their numbers during April and May, respectively. Although *H. marginatum* was present in lower numbers, its activity was bimodal, with peaks during May and September. Gharbi *et al.* (11) reported peak activity of *H. scupense* in semi-arid Tunisian regions during late June. This is thought to be due to the capacity of tick species to adapt to abiotic factors (e.g. temperature and hygrometry).

Insert Fig. 1 here

## Conclusions

There were too few ticks on the horses studied to establish the endemic stability of tick-borne infections, because no immunity could be established with such low tick numbers. This longitudinal study allowed the authors to identify the tick species infesting purebred Arabian horses and to study the infestation dynamics in a horse herd in the absence of treatment with acaricides during the study. Surveys should be performed in different ecological regions throughout Tunisia in order to provide veterinarians with two important types of information about the tick fauna of horses:

- The tick species present, in order to estimate the risk of pathogen transmission
- tick dynamics, to identify the risk periods when animals should be thoroughly surveyed and treated with acaricides.

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**Table I**  
**Mean monthly tick infestation prevalence, intensity and abundance in horses in the locality of Ghardimaou (north-west Tunisia) (by tick species)**

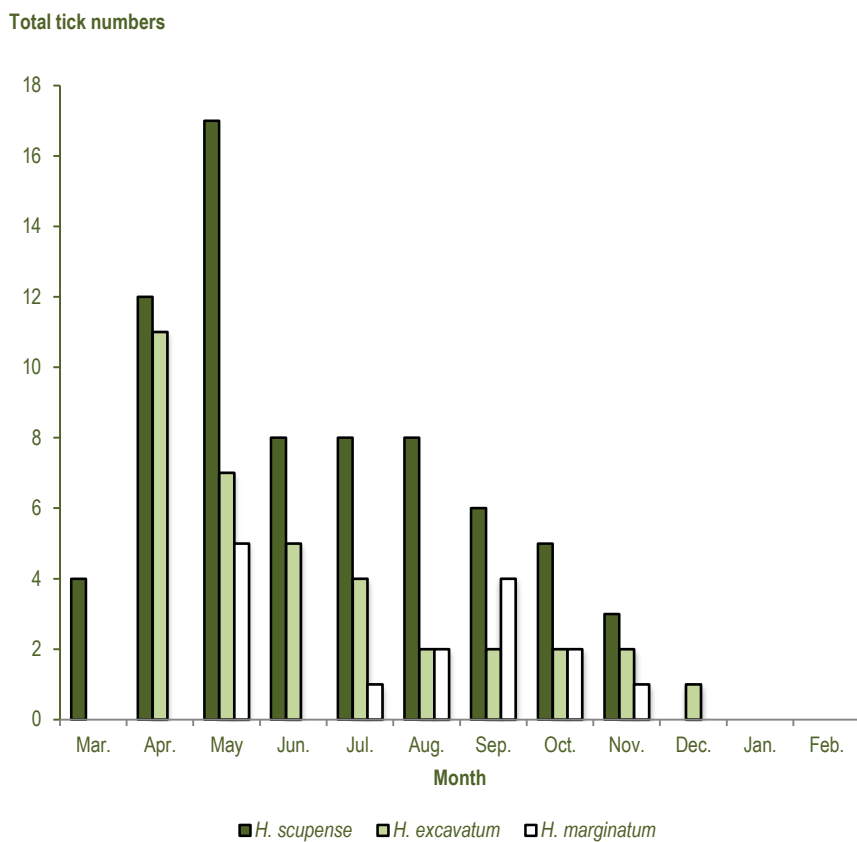
Tick species	Mean tick prevalence in % (range)	Mean infestation intensity (range)	Mean tick abundance (range)
<i>H. scupense</i>	20.1 (0–41.7)	0.6 (0–1.1)	2.9 (0–0.7)
<i>H. marginatum</i>	9.0 (0–29.2)	0.3 (0–0.7)	1.4 (0–0.5)
<i>H. excavatum</i>	3.1 (0–12.5)	0.1 (0–0.4)	0.6 (0–0.2)
Mean	29.5 (0–66.7)	0.3 (0–1.1)	0.1 (0–0.7)

Prevalence of tick infestation (%) = 100 x number of horses infested by ticks/number of horses examined

Infestation intensity = Number of ticks/number of horses infested

Infestation abundance = Number of ticks/number of horses examined





**Fig. 1**

**Total numbers of ticks collected monthly from horses in the Ghardimaou region (north-west Tunisia)**