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Research Article

Influence of Some Climatic Factors and Cattle Coat on the Seasonal Kinetics of Ticks and the Variation of Tick Density in the Sudano-Sahelian Zone of Cameroon

Marie Therese Mailaiso[1], Pierre Saotoing[2*], Mamoudou Abdoulmoumini[3]

[1]Department of Biological Sciences, University of Maroua, Maroua, Cameroon;[2]Higher Teachers Training College, University of Maroua, Maroua, Cameroon;[3]Department of Parasitology and Parasitological Diseases, University of Ngaoundere, Ngaoundere, Cameroon

ABSTRACT

Cattle infestation by ticks is a limiting factor for the development of livestock breeding in the semi-arid part of Cameroon. The local traditional strategies implemented to control the infestation of cattle by these parasites have had a lot of limitations. To remedy this, there was need to investigate on ticks' ecology. Thus, a study was carried out in this region from August 2019 to July 2020 to determine the influence of climatic factors and cattle coat colour on the dynamics, the community structure and the diversity of tick in traditional breeding systems. From these enquiries, it stems that rainfall and humidity were favourable for the development of *Amblyomma variegatum*, *Hyalomma marginatum* rufipes, *Hyalomma truncatum* and *Hyalomma impeltattum* tick species. A significant difference ($P<0.0001$) between the density of different tick species per month during the year was noted. In addition, cattle with red, spotted red, black, spotted black and spotted white coats were more infested by the different species of ticks than white-coated cattle ($P<0.05$). 41% of *Amblyomma variegatum* ticks were collected from the udders and testicles, 13% from the anal region, 14% from the chest, and 17% from other parts of the body. 38% of *Hyalomma marginatum* rufipes ticks were collected from the udders and testes, 20.8% from the anal region, 10% from the chest and 31% from other parts of the body. 48% of *Hyalomma truncatum* ticks were collected from anal region, 18% from the udders and testes, 27% from the legs and armpits and 7% from other parts of the body. 43% of *H. impeltattum* ticks were collected from the udders and testicles, 27% from the chest and 18% from the anal region and 12% from the other parts of the body. 80% of *Rhipicephalus sanguineus* ticks were collected from the testes, 19% from the anal region. 87% of *Boophilus decoloratus* ticks were collected from the testes and 13% from the anal region. This study is useful in setting up an appropriate strategy for the control of ticks and diseases they transmit by taking into consideration their seasonal activities.

Keywords: Ticks; Infestation; Cattle coat; Seasonal dynamics; Semi-arid area; Cameroon

INTRODUCTION

Ticks are a major constraint for the development of livestock production [1]. Livestock plays an important socio-economic role in the world. In Cameroon, livestock contributes to the production of the food required to satisfy populations' needs, provides jobs and generates income [2]. The national cattle herd is estimated at seven million and spread in order of importance between Adamawa, the Far North, North West, East and West Regions. Environmental conditions have a significant impact on the development of livestock breeding. Thus, in equatorial areas, too much rainfall, the density of the forest and the presence of the tsetse fly limit cattle breeding. The Northern part (Far-North, North and Adamawa), with a hot climate, low rainfall and a vegetation cover made up of wooded savannah and steppe constitutes the main production basin with 83% of the national livestock [3]. *Bos indicus* (zebu) is the most common cattle species [4]. Pastoral production is however limited by multiple constraints, including health problems. In Cameroon, cattle mortality of over 63% has been recorded at the 'Wakwa' research station and has been attributed to ticks and diseases they transmit [5]. The most prevalent parasitic diseases are the bovine trypanosomiasis, helminthiasis, anthrax, foot-and-

Correspondence to: Pierre Saotoing, School of Medical & Training College, University of Maroua, Maroua, Cameroon, Tel: +237693715144; E-mail: psaotoing@gmail.com

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mouth disease, brucellosis, babesiosis, anaplasmosis, heart water, dermatophilosis, theileriosis, and Crimean Congo haemorrhagic fever amongst others [6-8]. Most of these diseases are caused by tick infestation in cattle. In the Far North Region of Cameroon, cattle are reared under traditional systems and are grazed in pastures and forest where they are exposed to high risk of the tick infestation. In animal health, ticks are harmful blood-sucking ectoparasites and are important vectors of Tick-Borne Diseases (TBDs). The multiple perforations of cattle skin by ticks lead to lesions which constitute an entry point for several pathogenic agents [9]. In addition, the massive infestation of cattle by ticks leads to paralysis and animals parasitized by ticks suffer from anemia (which leads to weight loss), degradation of their skin, reproduction disorder and abortion. The consequences include reduced cattle productivity, deterioration in the quality of milk, meat and other products derived from livestock farming, as well as a decrease in economic value [10]. Despite progress recorded in the veterinary science sector to fight against ticks, they continue being a threat to the development of cattle breeding in Cameroun. The different strategies implemented to control cattle infestation by tick happen to have a lot of limitations and so it was necessary to study their bio-ecology in order to control ticks' infestation. The aim of this work is to determine the influence of temperature, humidity, rainfall and cattle coat colour on the dynamic, community structure and diversity of ticks in traditional breeding systems of the semi-arid zone of Cameroon.

MATERIALS AND METHODS

Study site

The Far North Region of Cameroon is located between 10° and 13° degrees North latitude and between 14° and 16° East longitude (Figure 1). It is the second most populated region with a headcount estimated at 3 897 577 inhabitants [11]. The prevailing climate is the Sudano-Sahelian type. Annual rainfall varies between 600 mm and 1000 mm, with an average of 800 mm. Humidity is very low, especially in the dry season. The average annual temperature is 34°C, in March (32°C), April (3°C) and May (34°C) being the hottest months, while December (26°C) and January (25°C) and February (27°C) are the coldest. This climate influences the availability and distribution of water resources required for the development of various agricultural and cattle breeding activities [4]. The vegetation is mainly made up of herbaceous steppe and shrub savannah, but there are still some isolated stunted and thorny trees with striated bark. Animal husbandry is one of the main activities of populations, with their herd made up of cattle, goats, horses and poultry. Human cohabitation with livestock could lead ticks to transmit them pathogens. Livestock farming is of the traditional type. It is characterized by the collective management of animals and a very limited use of veterinary inputs. To select the study sites, convenient sampling technique was used. As such, the main sites of Bogo, Pette, and Kalfou were selected for their high cattle numbers and their accessibility. These sites are characterized large transhumance areas with significant fodder. They are noted for the presence of herders from neighbouring countries (Nigeria, Niger and Chad). Cattle rearing are carried out in a traditional way by various ethnic groups. These people have a particular breeding system which consists in taking animals out to pasture at night and keeping them locked up during the day. In addition, the breeders are reluctant to be monitored by the Ministry of livestock.

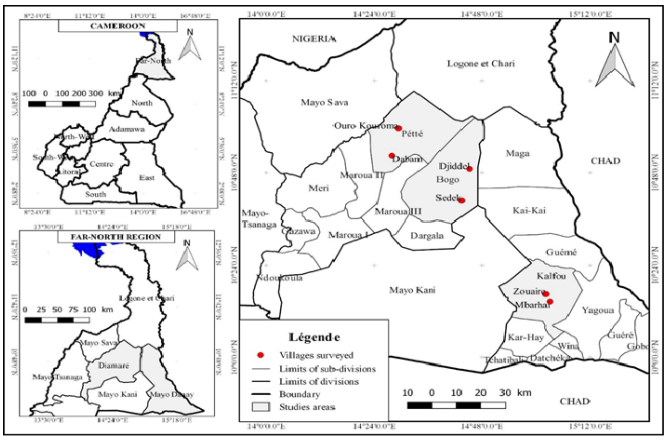

Figure 1: Map showing different study sites. **Note:** (•) Villages surveyed; (—) Limits of sub-divisions; (—) Limits of divisions; (—) Boundary; (▭) Studies

Tick sampling

Ticks were collected from cattle using surgical forceps after the animal had been restrained by ranchers wearing protective gloves. Restraining the animal made it easier to prick and it limited time loss. This also prevented the tick's rostrum from remaining attached to the cattle. The clamp was therefore placed as close as possible to the skin of the cattle. During the sampling stage, data were collected on the characteristics of each cattle. The tagging was done once a month per study site, per park, and per attachment site of ticks on cattle (legs, ears, head, armpits, udders, chest, tails and the rest of the body). The cattle were inspected thoroughly and all ticks were removed. Tick sampling on each cattle was done for 10 minutes taking into account the tick attachment sites (udders and testicles, flank, head, ears, legs, armpits, tail, chest and anal area) on the cattle. The least aggressive cattle were selected for further study [12].

Cattle

Cattle have been selected from three sites (Bogo, Pette and Kalfou). In each site, two farms were randomly chosen. A total of 108 cattle were selected based on sex, age and coat colour. Cattle coat colors were red, white, spotted red, spotted white, black, and spotted black by the method [13]. Their age ranged from one to ten years. The same cattle were monitored throughout the year.

Tick identification

Tick identification was carried out at the National Veterinary Laboratory (LANAVET) in Garoua, Cameroon. It was done on the basis of morphological and anatomical characteristics of ticks using a binocular magnifying glass (10X and 20X) and sometime with a binocular microscope (4X magnification) and identification keys. Identification consisted in determining the genus and species of ticks. The diagnosis of the genus was carried out on the basis of the morphological characters of certain parts of the tick's body (rostrum, eyes). The diagnosis of the species was carried out on the basis of criteria such as (punctuation of the scrotum, coloration of the legs, shapes of the stigmas, characteristics of the grooves and eyes. The tick identification keys of Walker et al. and Payne et al. [13-15].

Data analysis

The number of ticks was recorded per month, per fixing sites on

cattle. Temperature, humidity and rainfall in the study area were recorded monthly from the Maroua-Salak airport weather station for twelve months. Data were initially entered into a Microsoft Excel spread sheet before analysis. The Shapiro wilk normality test was performed before any analysis. Data have been analyzed descriptively and analytically. Comparison of the average density of the different tick species collected per month was carried out using the ANOVA test to determine whether seasonal variations had an influence on the infestation of cattle by ticks per month. A comparison of the average density of different tick species per type of farm was carried out using the ANOVA test to determine whether the breeding system had an influence on the way cattle are infested by ticks. A comparison of the average density of different tick species collected on different parts of the animal's body was carried out using the ANOVA test to determine whether the density of the different tick species vary per attachment sites on the cattle. A comparison of the average density of different tick species collected from cattle with different coats was carried out using the ANOVA test to determine whether the density of the different tick species collected is influenced by the cattle coat colour. The comparison means two by two was carried out by student's t-test. Statistical analyses were performed using R software. Differences between means were considered significant at $p<0.05$, very significant at $p<0.001$ and highly significant at $p<0.0001$. Graphs were made using graph pad version 5.03 and Excel. The Pearson correlation between the variation of the monthly average density of the different tick species and the variation of temperature, humidity and rainfall over the year was carried out in order to find out if there is link between the variation of these climatic factors and the variation in the level of infestation of animals by ticks.

RESULTS

Percentage of different tick species collected on animal per farm

We collected ticks from six farms in three sites (Bogo, Pette, and Kalfou). In each site, two different farms were chosen. Amongst the 108 cattle examined, 36 came from each study site and 18 per farm. A total of 13177 ticks were observed on cattle from all the three regions. Of the 13177 ticks collected in the three sites, three genera and six tick species were identified namely *Amblyomma variegatum*, *Hyalomma marginatum* rufipes, *Hyalomma truncatum*, *Hyalomma impeltatum*, *Boophilus decoloratus* and *Rhipicephalus sanguineus*. The following percentages of ticks have been collected respectively with regard to the aforementioned species. In Farm 1, the percentage of different tick species collected was 37%, 34%, 14%, 10%, 01.8%, and 0.62%. In Farm 2, it was 39%, 34%, 14%, 10%, 01.3% and 0.5%. In Farm 3, the percentage was 39%, 35%, 14%, 08.5%, 1.68% and 0.19%. In Farm 4 the percentage was 42%, 30%, 15%, 09.62%, 15% and 0.70%. In Farm 5, the percentage was 39%, 35%, 14%, 8.45%, 1.68% and 0.19%. In Farm 6 the percentage was 42%, 30%, 15%, 09.62%, 1.15% and 0, 7% respectively for *Amblyomma variegatum*, *Hyalomma marginatum* rufipes, *Hyalomma truncatum*, *Hyalomma impeltatum*, *Boophilus decoloratus* and *Rhipicephalus sanguineus*. In these six Farms, there was no significant difference between rates of different tick species collected from one farm to another. On the other hand, there was a very significant difference in the percentage of different species of ticks in the same farm throughout the entire farms of the three study sites ($P<0.0001$) (Figure 2).

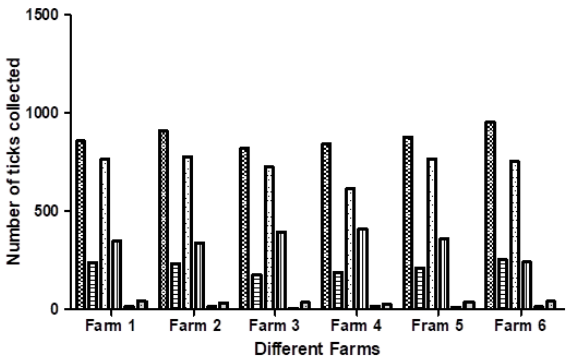

Figure 2: Number of ticks collected per farm. **Note:** (▩) AMV; (▭) HYI; (▭) HYM; (▭) HYT; (▨) RHS; (▭) BOD.

Tick communities structure on cattle

The structure of tick communities on the cattle's body the percentage of the *Amblyomma variegatum* species were 41%, 13%, 1.94%, 14%, 15.42%, 12%, 0.75%, 0.47% respectively at the level of the udders and testes, anal region, tail and the rest of the body, chest, legs and armpits, flank, head, and ears. The percentage of *A. variegatum* ticks was higher in udders and testes (41%), legs and armpits (15.42), anal region (13%) and chest (14%). As for the *Hyalomma marginatum* rufipes species, the percentage were 38%, 8.22%, 1.3%, 5.6%, 9.5%, 5.8%, 10.8% and 20.56% respectively at the level of the udders and testicles, flank, head, ears, legs and armpits, tail, chest and anal area. The percentage of *H. marginatum* rufipes is higher in the udders and testes (38%) and anal region (20.56%). Moreover *Hyalomma truncatum*, percentage were 18.8%, 1.5%, 0%, 0.69%, 27%, 0%, 2.9% and 48% at the level of the udders and testes, flank, head, ears, legs and armpits, tail, chest and anal region respectively. The percentage of *H. truncatum* ticks was higher in udders and testes (18%), legs and armpits (27%) and anal region (48%). Concerning the percentage of the *Hyalomma impeltatum* species, it varied from 43%, 0.7%, 0%, 0%, 4.4%, 27%, and 5.1% to 18% respectively at the level of udders and testes, flank, head, ears, legs and armpits, tail, chest and anal area. *H. impeltatum* ticks were more abundant in udders and testes (43%), breast (27%) and anal region (18%). *Rhipicephalus sanguinueus* and *Boophilus decoloratus* species were respectively found to be ranging from 80% to 87% and 13% to 19% at the level of testes and anal region respectively. There was a significant difference between the abundance of different tick species per preferential attachment area ($P<0.0001$) (Figure 3).

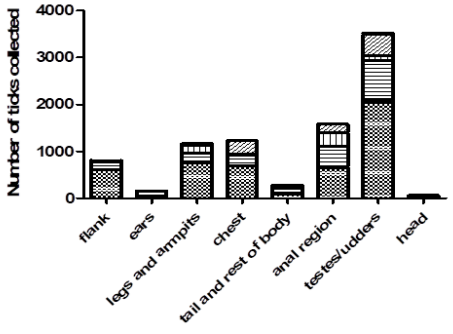

Figure 3: Structures of tick communities. **Note:** (▭) AMV; (▭) BOD; (▭) HYM; (▭) HYT; (▨) HYI; (▭) RHS

Influence of climatic factors on seasonal dynamics of ticks

The number of the different species of ticks *Hyalomma marginatum* rufipes, *Hyalomma impeltatum* and *Hyalomma truncatum* were very high during the months of June, July and September. The month of August showed a slight decrease in the density of different species of *Hyalomma marginatum* rufipes, *Hyalomma impeltatum*, *Hyalomma truncatum* and *Amblyomma variegatum*. The months of April and March showed a total disappearance of the *H. Truncatum* and *H. impeltatum* species on the cattle and a significant decrease in the number of *A. variegatum* and *H. marginatum* rufipes. The tick's *R. sanguineus* and *B. decoloratus* showed a poor distribution in cattle throughout the year. There was a significant difference in the distribution of different tick species over the months of the year ($P<0.0001$). The abundant rainfall observed during the months of June (87 mm), July (227 mm) and August (438 mm) was conducive for the development of tick species such as A. variegatum, *H. marginatum* rufipes. As humidity was high during the months of June (60%), July (78%), September (75%), October (68%), August (81%) and low during the months of November to May (Figure 4).

Correlations between the abundance of different tick species

The density of *H. impeltatum*, *A. variegatum* and *H. marginatum* rufipes ticks strongly correlated with this variation in humidity (Table 1). *H. marginatum* rufipes and *A. variegatum* ticks showed a positive correlation with precipitation (Table 2). The density of *H. impeltatum* ticks strongly correlated with the density of A. variegatum, *R. sanguineus*, and *H. marginatum* rufipes ticks. The density of *A. variegatum* ticks correlated with the density of *H. truncatum*, *R. sanguineus* and *H. marginatum* rufipes ticks. The density of *H. truncatum* ticks correlated with the density of Hyalomma.

Influence of coat on the abundance of different tick species per area

The *Amblyomma variegatum*, *Hyalomma impeltatum*, *Hyalomma marginatum* rufipes, *Hyalomma truncatum*, *Boophilus decoloratus* and *Rhipicephalus sanguneus* ticks species stuck more on cattle with red, spotted red, black, spotted black and spotted white coats than white coated cattle ($P<0.0001$) (Figure 5).

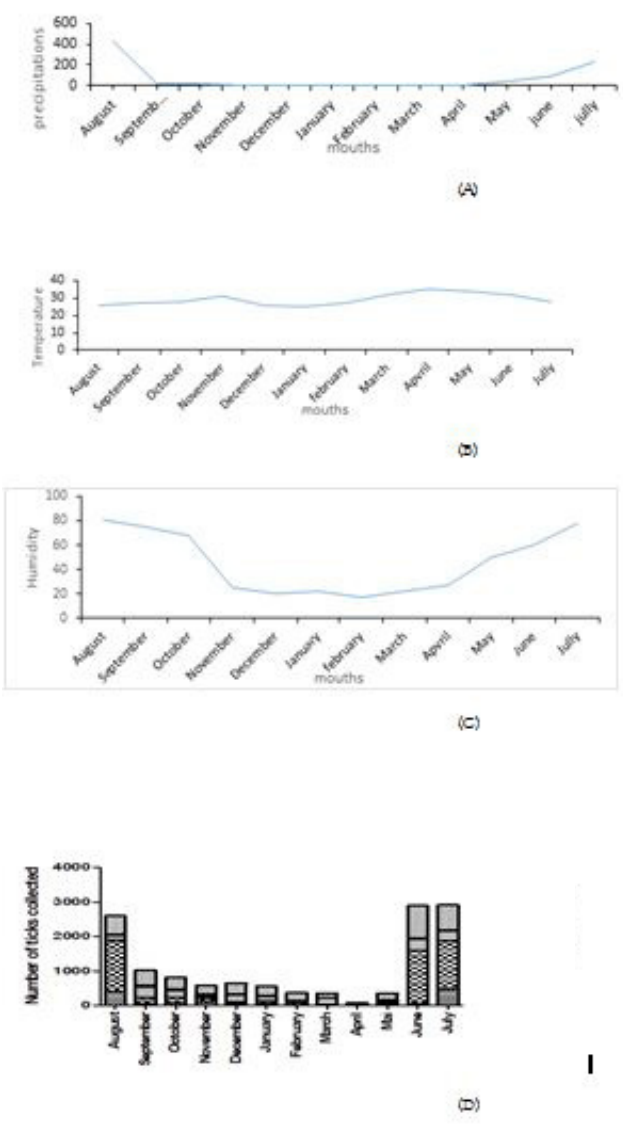

Figure 4: Monthly variation in the abundance of different tick species based on precipitation (A) Precipitations (B) temperature (C) Humidity (D) Number of ticks collected. **Note:** ( ) HYI; ( ) AMV; ( ) HYT; ( ) RHS; ( ) BOD; ( ) HYM.

Table 1: Correlations between rainfall, humidity, precipitation and abundance of different tick species.

S. No	HYI	AMV	HYT	RHS	BOD	HYM
HYI		0.853**	0.412	O.762*	0.419	0.81*
AMV			0.643*	0.679*	0.363	0.944**
HYT				0.257	0.268	0.790*
RHS					0.432	0.559
BOD						0.342

Note: AMV: *Amblyomma variegatum*; BOD: *Boophilus decoloratus*; HYI: *Hyalomma impeltatum*; HYM: *Hyalomma marginatum* rufipes; HYT: *Hyalomma truncatum*; RHS: *Rhipicephalus sanguinus* (*P<0.05, **P<0.01).

Table 2: Correlation between rainfall, humidity, precipitation and abundance of different tick species.

Climatic factors Tick species	Precipitation	Temperature	Humidity
HYI	0.529	-0.359	0.644*
AMV	0.638*	-0.348	0.672*
HYT	0.456	-0.197	0.469
RHS	0.267	-0.334	0.54
BOD	-0.05	-0.154	0.07
HYM	0.630*	-0.411	0.630*

Note: AMV: *Amblyomma variegatum*; BOD: *Boophilus decoloratus*; HYI: *Hyalomma impeltatum*; HYM: *Hyalomma marginatum* rufipes; HYT: *Hyalomma truncatum*; RHS: *Rhipicephalus sanguinus*. (*P<0.05)

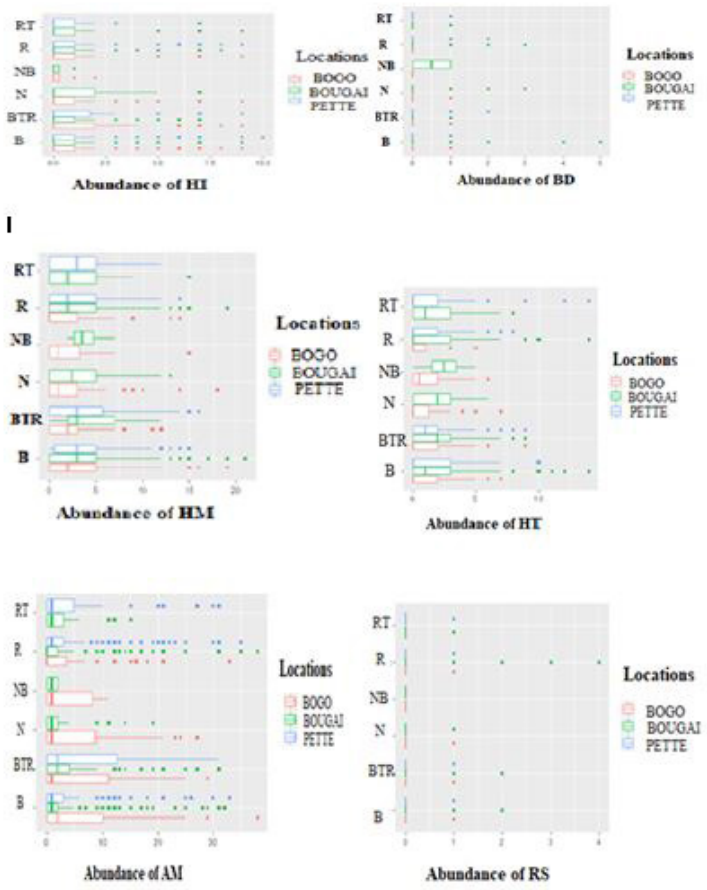

Figure 5: *Amblyomma variegatum*, *Hyalomma impeltatum*, *Hyalomma marginatum* rufipes, *Hyalomma truncatum*, *Boophilus decoloratus* and *Rhipicephalus sanguneus* ticks species stuck more on cattle with red, spotted red, black, spotted black and spotted white coats than white coated cattle (P<0.0001).

DISCUSSION

The aim of this work was to determine the influence of some climatic factors (temperature, humidity and rainfall) and cattle coat colour on dynamics, community structure and diversity of ticks in traditional breeding systems of the semi-arid area of Cameroon. Amongst the 108 cattle examined, 13177 ticks were collected. The identification revealed the presence of 3 distinct genera notably *Amblyomma, Hyalomma and Rhipicephalus*. These three genera were divided into 6 species of ticks. The *Amblyomma* genus was represented by a single species, *Amblyomma variegatum*. Threes species of the *Hyalomma* genus were identified: *Hyalomma truncatum*, *Hyalomma marginatum* rufipes and *Hyalomma impeltatum*. The *Rhipicephalus* genus was represented by two species *Boophilus decoloratus* and *Rhipicephalus sanguineus*. In the six parks, there was no significant difference between the percentages of different tick species from one park to another. There was a significant difference between the percentages of the different tick species in the same park. The low prevalence of *B. decoloratus* and *R. sanguineus* ticks species may be due to the natural resistance of zebu cattle to these ticks. The high prevalence of *A. variegatum* and *H. marginatum* rufipes, *H. truncatum*, *H. impeltatum* species is thought to be due to their parasite specificity for cattle and can also be justified by the high number of eggs laid by the females. The different species of ticks encountered in the semi-arid area of Cameroon are involved in the transmission of several livestock diseases. The *Amblyomma variegatum* tick is involved in the transmission of Cowdriosis and dermatophilosis. *H. truncatum* and *H. marginatum* rufipes are responsible for the transmission of Crimean Congo haemorrhagic fever, Bartonellosis. *R. sanguineus* and *B. decoloratus* are responsible for the transmission of *Anaplasma marginale* and *Babesia occultans* to cattle, as well as Rickettsioses to humans [16-17].

The attachment of ticks to parts of the animal showed that preferred sites were the well vascularized parts with thinner coat and skin. Ticks were most abundant in the testes and udders, anal region, chest, paw armpit, and flank. *A. variegatum* ticks were more abundant in the udders and testes (41%), anal region (13%) and chest (14%); *H. marginatum* rufipes ticks were more abundant in the udders and testes (38%) and anal region (20.8%); *H. truncatum* ticks were more abundant in the udders and testes (18%), legs and armpits (27%) and anal region (48%); *H. impeltatum* ticks were more abundant in the udders and testes (43%), breast (27%) and anal region (18%). *R. sanguinueus* and *B. decolorartus* species were found in the testes and anal region. These results do not fully corroborate those observed by Jelalu, and farougou, who rather found ticks in the ano-genital region, abdominal region, legs and ears. Previous work carried out in Nigeria on dogs showed that, dog ticks generally stuck to the ears, perineum, abdominal and scrotal region with a prevalence of 85%, 65% and 3.1% respectively at the level of the perineum, ears, abdominal and scrotal region kamto. The most infested parts by ticks are those that are in direct contact with vegetation [18-20].

This study also showed that climatic factors such as humidity and rainfall influence the seasonal dynamics of ticks in the two breeding systems common to the semi-arid area of Cameroon. The low rainfall observed during the months of the dry season is unfavourable for the survival of ticks. On the other hand, the high rainfall during the months of the rainy season (June, July and September) are favourable for the development of ticks. This influence of precipitation on the variation in the density of the ticks is thus justified by the strong correlation which is observed between variations in precipitation and variation in the density of *A. variegatum* and *H. marginatum* rufipes ticks, which show high occurrence throughout the year, while *B. decoloratus* and *R. sanguineus* species rather show low occurrence. On the other hand, *H. impeltatum* and *H. truncatum* ticks are present almost throughout the year with very low abundance during the months of March, April and May due to the total absence of rainfall. The increase in humidity is due to the increase in rainfall and the decrease in temperature. In fact, the increase in temperature and the disappearance of rains lead to a drop in humidity, making the environment uncomfortable for the development and hatching of eggs. The increase in the density of ticks is restored by the first moderate rains which lead to a drop in temperature and an increase in humidity, creating favourable conditions for the hatching of the eggs hence the blooming of ticks in June and July. The decrease in the density of ticks observed from October to May is due to unfavourable ecological conditions such as very high temperatures and very low humidity. This may be justified by behavioral diapause in adults and morphogenetic diapause in females [21]. When the environmental conditions are not met, the females delay the laying period until favourable conditions return. The comparison of our results with those of Kamto et al. carried out in Nigeria reveals that for all the tick species combined, the months of August and September show very high abundance of different tick species and the dry season stands as a period of low abundance of different tick species [20]. On the other hand, in the Sudanese zone of Benin Farougou et al. [19] an abundance of *A. variegatum* during the months of August to September and then from April to July was rather observed. *H. marginatum* rufipes ticks were present from September to November in Togo. *H. truncatum* are present from August to November in Togo. In the Centre Region of Cameroon, precisely in Yaoundé, observations during the months of June, July, August, March, April and May showed a high peak of adult *A. variegatum* ticks highlighted the abundance of ticks at the beginning and end of the rainy season [22,23]. The presence of *R. sanguineus* and *B. decoloratus* ticks was quite low throughout the year. This difference could be linked to the difference in ecological conditions between the two regions. Cattle parameters such as colour have also been shown to correlate with tick infestation. The cattle coat colour also influenced the abundance of ticks per cattle.

This study reveals that, ticks parasitize cattle with red coats, red spotted, white spotted with red (hybrid), black and black-white (hybrid) more than those with only white coats. A. variegatum, *H. marginatum* rufupes and *H. impeltattum* ticks attached themselves indifferently to cattle with red, spotted red, white, spotted white, black and white-black coat. These ticks are known for their elongated rostrum "longirostrum" which is able to penetrate the skin of the animal regardless of the thickness of the skin. Cattle with white coats could present particularly a very thick skin limiting the attachment of ticks with short rostrums. In addition, the white coat seems to expose ticks to predators. This could point to a behavioral adaptation method of ticks. *B. decoloratus* and *R. sanguineus* ticks preferentially stick to black-white cattle. These ticks have a very short rostrum "brevirostrum". Their rostrums can only attach to an animal if its skin is thin enough [24]. This finding indicates that ticks have a preference for red-colored cattle. According these authors, the dark coating allows the animals to camouflage themselves against their predator, which are the cattle egrets. These results corroborate those of Payne et al [13] who showed that coating in horses influence the attraction of different

species of ticks. Result of these finding shows that ticks were found on brown, white, black and grey horses with the *Boophilus decoloratus* species showing a preference for brown horses, while *A. variegatum* showed a preference for black horses, and *H. marginatum* rufipes for grey and brown horses. Young cattle were less infested than adult and old cattle. This can be explained by the fact that offspring born at the start of the rainy season are kept in park and do not follow their mothers to pasture. Thus, the young ones are not in contact with the different tick species found in the field. At the end of the rainy season, the young follow the adult and consequently collect the ticks in the pastures where tick infestation is already at its trough. Females were also more parasitized than males. These results concur with those of [25-27]. Who noted that female cattle were the most infested compared to males.

In the semi-arid zone of Cameroon, animal husbandry is one of the most profitable traditional activities. Ticks are therefore a major obstacle to the development of livestock breeding. The presence of different tick species in these animals consumed by humans poses several problems: drop in yield, exposure risks for livestock professionals and the possible contamination of meat, milk and their derived products. Consequently, this increases the risk of various zoonoses. It is therefore essential to put in place a strategy to fight against ticks and the diseases they transmit based primarily on the selection of cattle with tick-resistant coating.

CONCLUSION

This study has shown that in the Far North Region of Cameroon, rainfall and humidity are responsible for the seasonal variations of different species of ticks. The abundance of A. variegatum, *H. marginatum* rufipes, *H. truncatum* and *H. impeltatum* ticks increases with the onset of the rainy season and gradually decreases with its end, i.e. during the dry season. Cattle are mostly parasitized during the months of June, July, August and September. However, there was no significant difference in the prevalence of ticks on cattle in the two husbandry systems. Ticks attach themselves mostly to the udders, testicles, chest, anal area, and flanks due to the fact that these parts come into contact with vegetation during grazing and are also well vascularized. The colour of cattle coats influences the attraction of different species of ticks. Red, spotted red, black and spotted black coats are the most attractive to ticks. The most parasitized cattle are the older and females ones.

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