

Ticks (Acari: Ixodidae) in cattle from the gathering area of the Local Livestock Union of Cuajinicuilapa, Guerrero: prevalence and risk factors.

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Abstract:

Ticks are obligate hematophagous ectoparasites affecting cattle population and are incriminated in the transmission of numerous microorganisms with health and economic impact. This study aimed to identify the tick species parasitizing cattle in a gathering area from Cuajinicuilapa, Guerrero. Ticks collected were deposited in labeled disposable plastic container cups containing 70% alcohol, and transferred to the laboratory for identification purposes. A total of 224 ticks were collected, and according to the taxonomy, were identified as *Amblyomma mixtum* and *Rhipicephalus microplus*.

Keywords: *Amblyomma mixtum*, *Bos indicus*, *Bos taurus*, *Rhipicephalus microplus*

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I. INTRODUCTION

Worldwide, ticks are the first arthropods described as vectors of pathogens in domestic animals (Dantas-Torres *et al.*, 2012). These arthropod ectoparasites are obligate hematophagous, and comprises two main economically important families, hard-bodied or Ixodidae, and soft-bodied or Argasidae ticks (de la Fuente and Contreras, 2015). Around the world, ticks affect around the 80% of cattle population and are incriminated in the transmission of numerous microorganisms with health and economic impact (Hurtado and Giraldo-Ríos, 2019).

The genera *Amblyomma*, *Dermacentor*, *Haemaphysalis*, *Hyalomma*, *Ixodes*, and *Rhipicephalus* are among economically important cattle ticks (Kasaija *et al.*, 2021). In our country, there is a record of around 100 species, which corresponds to 11.3% of the known world diversity of ticks. *Argas*, *Antricola*, *Ornithodoros*, *Otobius*, and *Nothoaspis* represent the Argasid family; while *Amblyomma*, *Dermacentor*, *Haemaphysalis*, *Ixodes*, and *Rhipicephalus* represented the Ixodidae family (Pérez *et al.*, 2014). The genus *Amblyomma*, *Dermacentor*, *Ixodes*, *Ornithodoros*, *Otobius* (Guzmán-Cornejo *et al.*, 2007, 2011, 2016, 2019), and *Rhipicephalus* (Almazan *et al.*, 2018), have been recorded parasitizing cattle in Mexico.

Due to its medical and veterinary implications (Jongejan and Uilenberg, 2004; Johnson *et al.*, 2022), on-host collection is of high importance to monitor ticks, to improve our understanding in terms of population (Salomon *et al.*, 2020). For those reasons, the purpose of this study was to identify the ticks collected on cattle arrived to gathering area from Cuajinicuilapa, Guerrero.

II. MATERIALS AND METHODS

Study area

The present study was carried out from august to october 2021, at the gathering area of the Local Livestock Association of Cuajinicuilapa, Guerrero, Mexico (Figure 1). Geographically, the region is located between parallels 16°19' and 16°36' north latitude; the meridians 98°21' and 98°44' west longitude; elevation between 0 and 200 meters above sea level. A warm sub-humid climate prevails with rainfall in summer with an annual precipitation average of 1200 mm and temperature of 26 °C. The community occupies 1.0% of the regional surface and comprises 105 locations. It borders to the north with the municipalities from Juchitán, Azoyú and Ometepec; to the east with the municipality of Ometepec and the State of Oaxaca; to the south with the State of Oaxaca and the Pacific Ocean; and to the west with the Pacific Ocean and the municipality of Marquelia and Juchitan (INEGI, 2010).

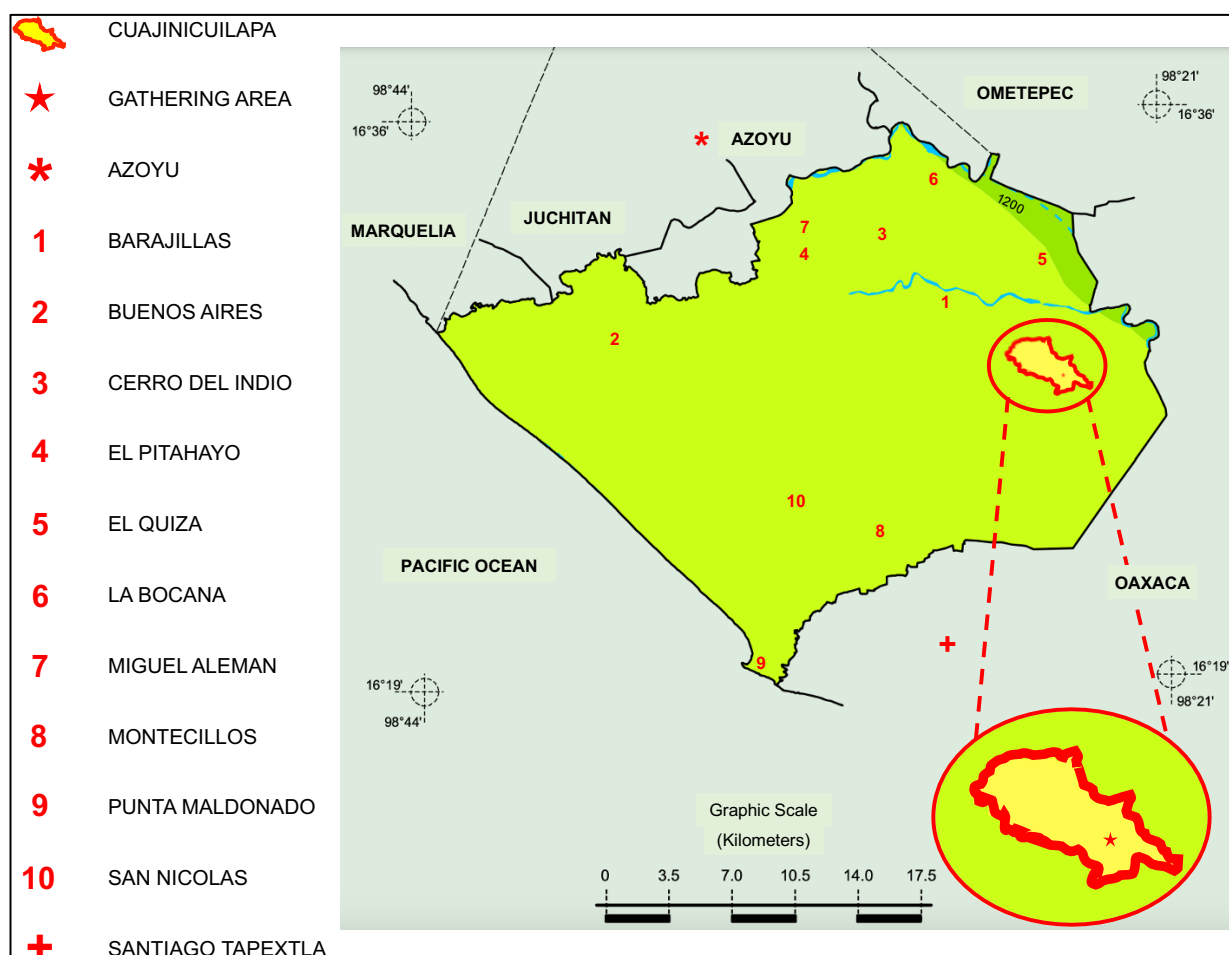


Figure 1. Map showing the collection site (★), within the community of Cuajinicuilapa. The numbers and symbols represent the places of origin of the animals. ★: Inside Guerrero state, but out of the study area, +: Outside Guerrero state.

Study type and sample calculation

According to their classification within the epidemiological studies, a transversal prospective observational study was carried out. In relation to the sample size, we collected ticks on the 100% of the animals arrived at the gathering area. This according to the adjustment of the sample size with respect to the population size (Jaramillo-Arango and Martínez-Maya, 2010).

Collection Technique

For search and collection of ticks, animals immobilized applying appropriate containment techniques (Garavito, 1985). Once the animal was immobilized, ticks were seeking by visual inspection and touching the skin, once located, the specimens were manually removed (Márquez-Luna, 2005), from different animal body parts, including the ear, arms, crotch, and perineum.

Specimen Identification

The collected specimens were deposited in a labeled disposable plastic container cups (Plastic World™) containing 70% alcohol. The samples were transferred to the Laboratory of Parasitology of the Faculty of Medicine Veterinary and Zootechnics No. 2 – UAGro, for identification with appropriate taxonomic keys (USDA, 1976).

III. RESULTS

During the study, samples were taken from a total of 24 animals, female calves (n = 3), male calves (n = 8), heifers (n = 8), and cows (n = 3). The bovines included in the study belonged to American Brown Swiss, Brahman, Guzerat, Gyr, and Sardo Negro breeds and their crossbreeds. The places of origin of the animals on which the ticks were collected are represented in the Figure 1. A total of 224 ticks were collected, and according

to the taxonomic keys, the specimens were identified as *Amblyomma mixtum* (n = 2; 1%), and *Rhipicephalus microplus* (n = 222; 99%) (Figure2).

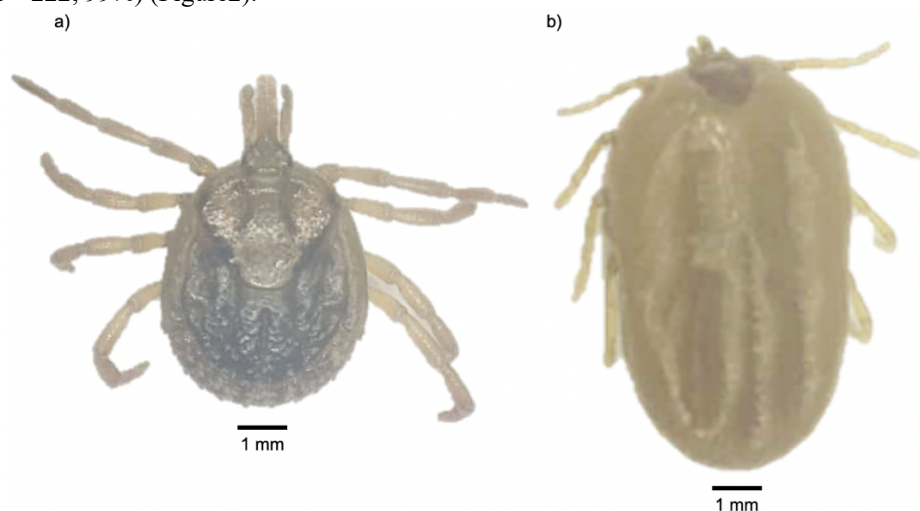


Figure2. a) *A. mixtum* female: long hypostome, ornate scutum, presence of eyes, and festoons. b) *R. microplus* female: short hypostome with palps shorter than chelicera, the posterior margin of the body does not have festoons.

IV. DISCUSSION

This study describes the tick species parasitizing cattle in a gathering area from Guerrero state, Mexico. *R. microplus* is the first tick specie of veterinary importance parasitizing cattle in tropical and subtropical areas or our country (Castañeda-Arriola et al., 2021), while *A. mixtum* is the second most important tick on bovines in the Mexican tropics (Romero-Salas et al., 2022), it can parasitize various hosts including bovines, equines, and humans (Romero-Salas et al., 2022).

In a study carried out to assess the populational dynamic of *A. mixtum* parasitizing European cattle (*Bos taurus*) in Mexico, Almazan et al. (2015) reported that the lowest numbers or collected specimens were recorded in January (n = 0) and from April-May (n = 3-5). Other study on this tick parasitizing water buffaloes (*Bubalus bubalis*) showed abundances ranging from 6-12 specimens in the month of August (Aguilar-Domínguez et al., 2018). In our study, only one specimen of *A. mixtum* was collected, in this sense, it is suggested that the populational dynamics would be not the same in the different regions of Mexico. In our country, a study reported the presence of *R. microplus* collected from red deer (*Cervus elaphus*) and cattle (*Bos indicus x Bos taurus*), the tick burdens of engorged females on red deer were n = 428 and on cattle n = 43 (Rodríguez-Vivas et al., 2013). In other study the sampling month turned out to be a source of significant variation for the number of partially engorged collected ticks, with the minimum number of specimens in October (n = 6), while the maximum number in July (n = 63) (Castañeda-Arriola et al., 2021).

Bovine anaplasmosis is caused by the pathogens *A. marginale* and *A. centrale*. The first is responsible for almost all outbreaks of clinical disease, in which the most marked clinical signs are anemia and jaundice, without hemoglobinemia or hemoglobinuria; while other signs are rapid weight loss and low milk production (World Organization of Animal Health, 2022a). The ticks *A. mixtum* (Aguilar-Domínguez et al., 2021) and *R. microplus* (Martins et al., 2020) are vectors of *Anaplasma* spp., and is a concern of great importance in animal health in tropical and subtropical regions around the world (Aubry and Geale, 2010). *R. microplus* was the most prevalent tick in our study, this is in line with the reported in the literature, where is presented as the most important ectoparasite in cattle (Castañeda-Arriola et al., 2021). Although *A. mixtum* was recovered in a very low number in this study, we suggest the possibility that this ectoparasite could, in other circumstances, parasitize cattle in these areas in greater numbers, and represent an important threat due to its possible role in the transmission of diseases, should not be ruled out.

Tick-borne protozoan parasites of the genus *Babesia* (order Piroplasmida, phylum Apicomplexa) are the causative agents of bovine babesiosis. In cattle, the principal involucrate species are *B. bovis*, *B. bigemina* and *B. divergens*. The normally observed signs in infections includes ataxia, anorexia, circulatory shock, fever, and sometimes nervous signs because of sequestration of infected erythrocytes in cerebral capillaries, as well as anaemia and haemoglobinuria (World Organization of Animal Health, 2022b). In Mexico, *A. mixtum* is associated with cattle; however, little is known about the pathogens associated with this tick (Romero-Salas et al., 2022). In the case of *R. microplus*, it is known that in Mexico this tick is a proven vector of the both pathogens, *B. bovis* and *B. bigemina* (Rojas-Martínez et al., 2021), the most important species due to the high

rate of morbidity and mortality, widely distributed in tropical regions (Thompson *et al.*, 1980; Lira-Amaya *et al.*, 2022).

Theileria spp., organisms (phylum Apicomplexa, order Piroplasmida, family Theileriidae) are another parasite of importance transmitted by ticks. This obligate intracellular protozoan infects members of the family Bovidae (World Organization of Animal Health, 2022c). The disease causes a debilitating condition, characterized by fever, enlargement of superficial lymph nodes, reduced milk yield, weight loss, abortions, and mortality, with a high economic impact (Abdela and Bekele, 2016). *T. parva* and *T. annulate* respectively, cause East Coast fever and Tropical theileriosis in *Bos indicus* x *taurus* (cattle), *Bubalus bubalis* (water buffalo), and *Bos grunniens* (yaks), but reports over the presence of both pathogens does not exist in Mexico (Almazán *et al.*, 2022), since the main tick vectors *Hyalomma* spp., *R. appendiculatus*, *R. zambeziensis* and *R. duttoni*, does not occur in Mexico (Bonnet *et al.*, 2022). On the other hand, *T. orientalis* was reported in beef cattle in USA in 2017 and is considered an emerging pathogen; while *T. cervi* has been reported ungulates in Northern Mexico (Almazán *et al.*, 2022), and is transmitted by the lone star tick *A. americanum*, ectoparasite that has been recorded parasitizing cattle (*Bos taurus*) from Mexico (Guzmán-Cornejo *et al.*, 2011).

V. CONCLUSION

Our study reports two tick species parasitizing cattle in the municipality of Cuajinicuilapa, Guerrero, Mexico. Both species play an important role in potential pathogen transmission. It is necessary to carry out populational dynamics studies, and to identify tick-associated pathogens. It is also important to determine acaricide resistance and implement control measures. It is necessary to keep in mind the public health problems and zoonoses that the presence of these ticks implies and implement prevention measures.

CONFLICT OF INTEREST

Authors declare no conflicts of interest.

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