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PRELIMINARY EVALUATION OF THE REPELLENT EFFECT OF *Aloe vera* GEL AND *Cocos nucifera* OIL AGAINST *Rhipicephalus sanguineus* TICKS IN NATURALLY INFESTED DOGS

By

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Abstract

The *R. sanguineus* tick is an ectoparasite of canines that feeds on blood. It has the potential to transmit pathogens that pose a risk to public health. A search is underway for alternatives to traditional chemical products that are both environmentally and animal-friendly. The objective of the present study was to ascertain the repellent effect of a combination of aloe vera pulp extract and coconut oil against *R. sanguineus* ticks on canines. A total of ten canines, comprising both male and female subjects, were utilized in the treatment. The subjects ranged in age, size, weight, and breed, with the caveat that they must have been afflicted with ticks. The repellent effect was observed from 6 hours onwards and persisted for a period of four days. The in vivo study of the combination of aloe vera gel and coconut oil demonstrated a repellent effect against ticks present on the host.

Keywords: Phytobiotics, ticks, repellency.

1. INTRODUCTION

Ticks are ectoparasitic arthropods that feed on the blood of their hosts. Furthermore, when feeding on blood, they can act as vectors for potentially pathogenic microorganisms, which are transmitted via the bite through the ingestion and regurgitation of blood (Tahir *et al.*, 2020). Microorganisms transmitted by ticks include bacteria, protozoa, rickettsiae and viruses (Gong *et al.*, 2025). It is known that there are more than 900 species of ticks worldwide, and can parasitize humans, domestic animals and wildlife (Tabor, 2024). Canines are frequently hosts to a variety of tick species, including those that are endemic parasites of wild species (Kamyngkird *et al.*, 2024). However, *R. sanguineus*, also known as the brown dog tick, is considered the most significant ectoparasite in domestic canids (Zahri *et al.*, 2025).

R. sanguineus is a three-host tick that has the capacity to complete its larval, nymphal and adult life cycle on one or more canines (Dantas-Torres, 2010). In recent years, chemical acaricides have been the primary means of tick control. Nevertheless, the excessive utilization of these chemicals has

resulted in the development of resistance, thereby diminishing the efficacy of these products (Makwarela *et al.*, 2025). Moreover, this has led to environmental degradation, including the contamination of soil and water sources with chemical residues, and the subsequent impact on human health (de Oliveira *et al.*, 2015). Consequently, alternative strategies have been explored, including the use of essential oils (Koc *et al.*, 2024), entomopathogenic fungi such as *Beauveria bassiana* and *Metarhizium anisopliae* (Abuowarda *et al.*, 2020) and plant extracts (Teixeira-Pinto *et al.*, 2018; Molaba *et al.*, 2025).

The *Aloe vera* L. plant is a perennial herbaceous plant of the Asphodelaceae family. It contains over 160 chemical compounds that are used as ingredients with various medicinal properties (Basunia *et al.*, 2021). Notably, these include its use as an alternative repellent against the *Hyalomma dromedarii* tick (Radwan *et al.*, 2023). Furthermore, the coconut, the fruit of the coconut palm (*Cocos nucifera*), which belongs to the Arecaceae family, contains a vast number of metabolites with diverse pharmaceutical properties, including antiparasitic activity



(DebMandal and Mandal, 2011), and studies have demonstrated its acaricidal and repellent activity against the tick *Amblyomma sculptum* (Barrozo *et al.*, 2021). The objective of this study was to ascertain the repellent properties of a combination of aloe vera pulp extract and coconut oil against *R. sanguineus* ticks on naturally parasitized canines.

2. Materials and Methods

a. Study Location

The study was conducted in October 2025 in Cuajinicuilapa, Guerrero. The area's geographical location is specified as lying between 16° 19' and 16° 36' north latitude and 98° 21' and 98° 44' west longitude. The altitude of the region varies from an initial baseline of 0 meters above sea level to a maximum altitude of 200 meters above sea level. The region's climate is characterized by warmth and sub-humidity, with a seasonal precipitation pattern that is marked by an annual rainfall range of 1,100–1,300 mm, typically occurring during summer months. The vegetation at the site consists of grassland, jungle and mangrove, where land use is primarily agricultural and urban (INEGI, 2010).

b. Collection of materials and preparation of the repellent

The *Aloe vera* leaves were collected in situ from a plant in a garden. The subjects were then transferred to the Multidisciplinary Laboratory of the Facultad de Medicina Veterinaria y Zootecnia No. 2 de la Universidad Autónoma de Guerrero, in Cuajinicuilapa. The extraction of the pulp from the leaves was accomplished by utilizing an aluminum roller press (AlvinmaMX). The total mass of the leaves was determined to be 1,021 g. The gelatinous mass was subjected to a process of filtration through a sieve, with the objective of removing any particulate matter, thereby yielding a final total volume of 150 mL. Furthermore, 150 mL of coconut oil, purchased from a local establishment, were utilized in the experiment. The mixture of the leaf gel and the oil was accomplished by employing a metal stirrer (Anzeser, 716 Pl) equipped with a heating plate that operated at a speed of 2000 rpm. A 15-minute waiting period was observed to ensure the attainment of a homogeneous mixture, which was subsequently transferred to a 1 L amber-colored bottle with the objective of protecting the mixture from damage or degradation caused by sunlight. The product was then divided into 10 sterile clinical sample vials, to which 15 mL of aloe vera gel and 15 mL of coconut oil were added, thus yielding a total volume of 30 mL.

c. Animals

A group of ten canines, comprising both male and female subjects, was employed for the study. The subjects appeared to be in good health and varied in age, size, weight and breed. The inclusion criteria for the animals were that they had ticks and had not been bathed or treated with a tick repellent in the previous three months. Participants who did not meet these criteria were excluded from the study. The participation of canines was authorized by their respective owners, following the provision of informed consent. At the animals' homes, the areas with the highest tick presence were identified through

observation and palpation. Photographic evidence was obtained of the withers and ears, where the highest concentration of ticks was observed prior to treatment, and at 6, 12, 24, 48, 72 and 96 hours after application of the product, to assess its effect.

d. Data analysis

Tick counts were summarised using descriptive statistics, and percentage reduction was calculated relative to the baseline mean.

3. RESULT

On the day of commencement of treatment, the mean was 15.4 ticks per dog. The lowest number of ticks found on a single animal was 2.0, while the dog with the heaviest infestation had 35.0 ticks. The repellent effect was observed from 6 hours onwards, with an average decrease of 4.2 ticks per day following treatment, ranging from a minimum of 2.0 to a maximum of 12.0 ticks per dog. The sustained effect was confirmed by the absence of any subsequent ticks on the animals. Subsequently, none of the canines were observed to have any ticks from 48 hours onwards, and this remained the case up to 96 hours following the administration of treatment. As demonstrated in Figure 1, a clear downward trend is evident in the number of ticks infesting each dog.

Because the same animals were evaluated repeatedly, the sample size was small and post-treatment zero values were present, the effect of time was analysed using the non-parametric Friedman test. Post-treatment times were compared with baseline using paired Wilcoxon tests with Bonferroni adjustment. At baseline, dogs had 15.4 +/- 10.95 visible ticks, with a median of 15.0 and a range of 2 to 35 ticks. Mean counts decreased to 10.9 +/- 9.35 at 6 h, 6.9 +/- 6.59 at 12 h and 2.6 +/- 3.03 at 24 h, corresponding to reductions of 29.2%, 55.2% and 83.1%, respectively. No visible ticks were observed from 48 to 96 h. Tick counts decreased significantly over time (Friedman: chi-square = 51.63; df = 6; P < 0.001). Paired Wilcoxon tests showed significant reductions from 6 h onward after Bonferroni adjustment (P < 0.05) (Figure 1).

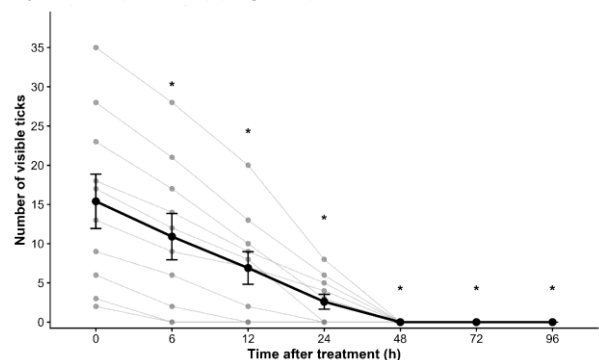


Figure 1. Dynamics of visible *Rhipicephalus sanguineus* ticks in naturally infested dogs after topical application of a formulation based on *Aloe vera* and *Cocos nucifera* oil. Grey lines represent individual dogs, and the black line represents the mean ± standard error. Asterisks indicate significant

differences compared with baseline using paired Wilcoxon tests with Bonferroni adjustment ($P < 0.05$).

4. DISCUSSION

The present study investigated the repellent effect of a combination of liquid aloe vera pulp extract and coconut oil against *R. sanguineus* ticks on dogs with natural infestations. Botanical sources can be used to explore or develop safe repellents against arthropods of medical and veterinary interest (Dolan and Panella, 2011; Mollong et al., 2025; Sadhu et al., 2025). Both the *A. vera* plant and the fruit of *C. nucifera* are known to contain various components with biological activity, including antiparasitic action (Upadhyay, 2018; Tayler et al., 2019). Thus, Barrozo et al. (2021) and Radwan et al. (2023) have used by-products of *A. vera* and *C. nucifera* to study their effects on ticks of the genera *Amblyomma* and *Hyalomma*, respectively.

In the case of ticks of the genus *Rhipicephalus*, Matos et al. (2017) tested the *in vitro* acaricidal effect of *Aloe arborescens* extract on engorged females of *R. microplus*. The results showed an effect on reproductive parameters, with a marked decrease in the number of eggs laid and in the larval hatching rate. Meanwhile, Jeyathilakan et al. (2019a) evaluated the *in vitro* effect of *Aloe vera* mucilage on inhibiting hatching in *R. microplus* eggs. The egg mass was immersed in the mucilage and examined daily until hatching; however, the results were not encouraging, as the use of *A. vera* did not inhibit hatching. In a separate study, Jeyathilakan et al. (2019b) evaluated the *in vitro* acaricidal properties of *Aloe vera* aqueous extract on *R. sanguineus* ticks. The results of this study revealed an immediate effect on the larval and adult stages of the tick within a few minutes of exposure. In the present study, the evaluation was conducted on ticks on the host; however, as previously mentioned by the authors, the repellent effect was also evident in this study, but only from the first 6 hours of application. *Aloe vera* gel contains active ingredients that have been demonstrated to enhance its biological activity in a manner that is synergistic, thereby disrupting the life cycle of ticks (Radwan et al., 2023).

With regard to the use of coconut oil, Zhu et al. (2018) tested this compound and observed a strong repellent effect against the ticks *A. americanum* and *R. sanguineus*, providing protection for up to 7 days. In another study, Viste et al. (2013) assessed the efficacy of virgin coconut oil shampoo against dog ticks; the dogs were examined one hour and 24 hours after shampoo application to determine the presence or absence of ticks, and the results revealed that the shampoo is highly effective against ticks. Furthermore, Jayasena et al. (2026) assessed the time elapsed between contact with coconut oil and the inactivation of *R. haemaphysaloides* ticks; the results showed that 1,056.6 seconds elapsed following the impregnation of the ticks with the oil. It is suggested that the viscosity of coconut oil is essential for penetrating the spiracular openings and blocking the tick's respiratory system (Jayasena et al., 2026).

5. CONCLUSION

It was concluded that the *in vivo* study of the combination of *Aloe vera* gel and coconut oil on the brown dog tick demonstrated a repellent effect against ticks present on the host. However, further studies are required to investigate the time elapsed between contact and tick mortality. Moreover, in the case of females, it is necessary to assess whether they perish before completing egg-laying and, if they do lay eggs, to determine the survival rate of the larvae. It is imperative to ascertain the active ingredients present in local products, with a view to replacing chemical pesticides and thereby contributing to environmental benefits.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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DATA AVAILABILITY

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

Alvarado-Rodríguez, G. and González-Álvarez V. H. conceived, designed the study, and drafted the manuscript. Domínguez-García, S. V., and Carrillo-Balazar D. B., collected and prepared the plant mixture, applied and follow the treatment to the dogs. Alvarado-Rodríguez, G., González-Álvarez V. H., and Cañaveral-Martínez U. R. contributed to data interpretation and manuscript revision. All authors read and approved the final manuscript.

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