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Prevalence of tick infestation in farm Animals from Libya

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ABSTRACT

One of the most significant external parasites afflicting agricultural animals globally, especially in tropical and subtropical areas, is the tick. In addition to directly contributing to financial losses through decreased milk production, weight loss, and skin damage, they also play a significant role in spreading a number of pathogenic agents that endanger the productivity and health of animals. The majority of research on tick prevalence and species distribution in Libya dates back to the colonial and early post-colonial eras, making these studies few and dispersed. With an emphasis on ticks' biological and ecological traits, their effects on the economy and productivity, and the current understanding of their distribution in Libya, this study attempts to offer a theoretical framework on the prevalence of tick infestation in farm animals in that country. This study highlights the need for updated epidemiological investigations and finds gaps in the existing literature by drawing on secondary sources, such as published articles, reports, and prior surveys. The results indicate that tick infestation is still a major problem for Libyan livestock output, posing a threat to food security and causing large financial losses. In order to lessen the negative effects of ticks on farm animals and promote livestock sustainability in Libya, the study ends by suggesting more applied research, better management techniques, and integrated tick control tactics.

Keywords: Ticks; Farm animals; Libya; Ectoparasites; Livestock production; Animal health.

Introduction

An important factor in the spread of infectious diseases is ticks. Since many viruses can infect several species, emerging or re-emerging infectious diseases are significant worldwide issues that affect both human and animal health. The incidence of zoonotic infections has increased due to bacterial pathogens' growing resistance to antibiotics; these outbreaks can occasionally be extensive and result in significant morbidity and mortality among humans, domestic animals, and wildlife. (Cunningham, 2017)

Infectious diseases are now a growing concern for both animal husbandry and the general public. Accelerating climate change poses significant risks to society and public health. Climate instability and global warming contribute in part to the emergence, resurgence, and global redistribution of infectious diseases. Epidemics and zoonoses have spread around the world as a result of the ability of parasites to spread into new geographic areas or establish ranges in common locations due to globalization and climate change. (Muzaffar, 2007)

Libya has enormous oil and gas deposits that supply the world's energy demands, making it a significant global energy supplier. Consequently, the area has experienced significant growth and transformation. Agriculture has grown as a result of this growth, mostly to meet the needs of an expanding population. (Faour, 2018) Traditional and modern farming methods are used to raise sheep, goats, cattle, buffalo, and camels. (Hasson, 2014) Large amounts of milk, meat, wool, and hides are produced by these animals. The Middle East and North Africa (MENA) cattle sectors are seriously threatened by ticks. Because they can spread a number of diseases, ticks are extremely important for human, veterinary, and economic health. (Montiel, 2007) In the MENA region, the tick genus Hyalomma alone is responsible for large losses in camel and other livestock products. (Alanazi, 2018) Although several ticks and tick-borne diseases are known to exist in the Arab world, little is known about the functions that various tick populations play as pathogen vectors and reservoirs and how they affect cattle.

Despite the importance of livestock in Libya, little research has been conducted to determine the prevalence and risk factors of tick infestation in farm animals. Therefore, this study aims to fill this gap by providing a theoretical analysis of available data.

Fourteen tick species were described by Hoogstraal and Kaiser (1960) in relation to Benghazi, Misrata, Sebha, and Jadu, among other locations in Libya. During a three-year assessment including 58 farms in Libya, Gabaj et al. (1992) reported collecting and recording data on 20,391 animals from 13 species of hard ticks and two species of soft ticks. (Shebani, 2024)

Infesting farm animals (Elsaid et al., 2013; Hador, 2015; Abdulsalam, 2017; Kharwat, 2018; Alfitory, 2021), wild animals and captured animals (Hosni and Maghrbi, 2014; Alzanati et al., 2020), or tick pathogens (Saadawi, 2017) are just a few of the recent studies on tick diversity carried out in Libya.

It has been determined that there are 26 different species of ticks in Libya (Hador, 2015; Abdulsalam, 2017). Because the conditions in the examined areas of Libya differed, it was discovered that the species found there varied. In different ecosystems, tick distribution and the

zoonotic illnesses they spread are greatly influenced by environmental and climatic conditions (Mehlhorn, 2012).

Study problem

One of the most serious ectoparasitic issues affecting agricultural animals globally is tick infestation, which causes enormous financial losses through lower productivity, weight loss, decreased milk and meat yield, and disease transmission. With little scientific information on tick infestation's frequency, distribution, and risk factors, the problem is still poorly understood in Libya, where raising cattle is a major source of revenue and food security. Implementing efficient control and prevention efforts is hampered by the dearth of current epidemiological studies. In order to give evidence-based insights that can assist veterinarian health initiatives and improve livestock management practices, it is vital to look into the prevalence of tick infection in Libyan farm animals.

Study objectives

1. To determine the prevalence of tick infestation in different species of farm animals in Libya.
2. To identify the most common tick species infesting farm animals in the study area.
3. To examine the seasonal variations and distribution patterns of tick infestation.
4. To assess the risk factors (such as animal species, age, sex, management system, and geographical location) associated with tick infestation.
5. To provide evidence-based recommendations for controlling and preventing tick infestation in Libyan farm animals.

Study questions

1. What is the overall prevalence of tick infestation in farm animals in Libya?
2. Which tick species are most commonly found infesting farm animals in the study area?
3. How does the prevalence of tick infestation vary across different animal species (e.g., cattle, sheep, goats, camels)?
4. Are there seasonal variations in the occurrence of tick infestation among farm animals in Libya?
5. What are the major risk factors (age, sex, management practices, and geographical location) associated with tick infestation?
6. What preventive and control measures can be recommended to reduce tick infestation in Libyan farm animals?

The Importance of the Study

Tick infestation poses a serious threat to animal health, productivity, and general livestock management, which makes this study important. Tick infection can have an especially negative effect in Libya, where livestock is essential to rural livelihoods, food security, and the country's economy. This study will close a significant knowledge gap about ectoparasites in Libyan farm animals by identifying tick species, assessing risk factors, and calculating prevalence. The results will help create efficient control and preventive plans in addition to giving veterinarians, farmers, and legislators baseline data. In the end, the research will contribute to lowering financial losses, enhancing animal welfare, and bolstering Libya's livestock industry's sustainability.

Study hypotheses

1. Tick infestation is prevalent among farm animals in Libya at a significant rate.
2. There are variations in the prevalence of tick infestation among different species of farm animals (cattle, sheep, goats, camels, etc.).
3. Certain tick species are more dominant and widely distributed in Libyan farm animals than others.
4. Seasonal changes significantly influence the rate of tick infestation.
5. Risk factors such as animal age, sex, geographical location, and management practices are significantly associated with the prevalence of tick infestation.

Theoretical framework

1) Biological and Ecological Characteristics of Ticks

All ticks are obligatory, transient parasites of vertebrates that cannot exist without blood. Both males and females must take blood during their intricate growth cycle as larvae, nymphs, and adults. As a result, ticks can be included into the epidemiological chain of pathogen transmission by the so-called transovarial (female-to-egg, also known as vertical) or trans-stadial (stage-to-stage, also known as horizontal) passages.

Through the removal of superfluous water, ticks consume concentrate blood meal. This makes room for the relatively small body's massive blood intake (several millilitres). Their successful life was facilitated by their engorgement and blood-sucking habit, longevity, great reproductive potential, relative freedom from natural enemies, and highly sclerotised bodies that shield them from environmental stress (Estrada-Peña et al., 2013). at addition to having long hunger tolerance and multi-year life cycles, ticks may survive the cold at different stages. The ticks' gut's slow intracellular digestion of blood protects germs in an intracellular location and permits them to evade the digestive process. According to Gary and Lance (2009), efficient tick parasitism is facilitated by an early, painless bite, saliva that contains pharmacologically active substances that mediate the host immune response, and anticoagulant substances that permit continuous blood flow into feeding sores.

Ticks are ectoparasites of livestock that are members of the order Acari, phylum Arthropod, and class Arachnida. There are now three recognised families: the Ixodidae (which includes 692 species of hard ticks), the Argasidae (which includes 186 species of soft ticks), and the newly discovered Nuttalliellidae (which has only one species, Nuttalliela namaqua), which has intermediate traits (Naval et al., 2010).

Tick species that are significant disease-carrying agents for both people and animals are found in the first two families. According to Swanson et al. (2006), these zoonotic agents are maintained in cycles between ticks and reservoir hosts, where humans may get clinically unwell but are typically considered "dead-end" hosts since they do not participate in the transmission cycle.

The four stages of tick development are egg, larval, nymph, and adult. Every tick species is obligatory blood-sucking parasite, including larvae, nymphs, and adults (Taylor et al., 2007).

Tick species in the Ixodidae family are inflexible; the dorsal scutum covers the male and female idiosomas' anterior portions; the mouth parts are terminal and visible from above; the stigmata are situated behind the coxae IV; the body is typically wrinkled; and the ticks are relatively large, measuring between 2 and 20 mm, flattened dorso-ventrally. According to Walker et al. (2007), all ixodid ticks have a chitinous coating, also known as a scutum or conscutum, which is a hard plate on the dorsal surface that covers the entire male's dorsal surface but only a tiny portion of the larva, nymph, or female's back below the gnathosoma.

Stigmata are typically found between coxae III and IV, the body is frequently smooth, the mouthparts are ventral and invisible from above, and the scutum is absent in tick species belonging to the Argasidae family.

Ticks are ectoparasites that feed on blood from mammals, birds, and reptiles. There are over 800 species of ticks worldwide, but they thrive in warm, humid climates because low temperatures prevent them from developing from egg to larva. The broad-scale host factors that restrict tick species' distributions have not been conclusively determined. It may be deduced that a major factor impeding the expansion of tick species ranges is a direct effect of climate, since the majority of tick distributions are not species-limited. (Desta, 2016)

Tick population abundance is largely controlled by the microclimate in the vegetation layers where they live. The seasons during which ticks are active are also influenced by the weather. Long stretches of high temperatures during the summer in temperate regions, coupled with the air's strong desiccating power, may encourage an increase in the death rates of moulting or questing stages. According to Duguma et al. (2012), inadequate management practices, poor nutritional status, and environmental and climatic factors are generally blamed for the incidence of tick-borne cattle diseases.

2) Economic and Productive Impact of Tick Infestation on Livestock

Ticks have a negative effect on the amount and quality of milk produced by cattle. According to many reports, ticks are severely reducing cattle's ability to produce milk, which is linked to poor management practices and nutritional status (Duguma et al., 2012). During her parasite phase, the female tick can consume 1.0 ml of the cow's blood, which results in a weight loss of approximately 1 gramme and lowers and affects the milk product by approximately 8.9 ml. Every tick bite impairs the host's immune system and induces stress, which has an impact on the animals' performance. Tick-related economic losses can be measured in terms of average annual financial loss (production loss plus control costs) per animal or in terms of body weight or milk output lost per engorged tick (Jonsson, 2006).

Because ticks might lower potential production, severe Boophilus microplus infestations limit the cattle's capacity to grow to its maximum weight. Animals infested with 40 ticks per day on average may lose 20 kg of weight annually, and if treatment is not received, animals infested with more than 200 ticks for six weeks may perish.

In Ethiopia, 12–16% of export value is made up of hide and skin. In Ethiopia, there are around 60 types of ticks known to infest both domestic and wild animals. However, the worldwide market, which is mostly linked to tick markings, places little value on hide and skin that come

from East and Central African nations, such as Ethiopia (Abunna et al., 2012). Ticks can damage skin and conceal its quality by penetrating the skin and creating holes in the mouth, which are flaws in processed skin. When feeding, ticks may permit bacteria to penetrate the skin, resulting in the formation of a local abscess that damages skin quality more costlyly than the feeding hole (Taylor et al., 2007).

A substantial loss in the production system could result from the approximately one billion cattle, mostly in tropical areas, that are plagued by different tick species or the diseases they spread. In addition to decreasing productivity, infection by these parasites in these areas may result in the death of the more vulnerable animals.

3) Tick Infestation in Libya

Several investigations on animal parasites in Libya were carried out prior to World War II by Italian researchers, followed later by the work of Hoogstraal and Kaiser. Early Italian studies mainly focused on tick-borne human diseases and reported species such as Ornithodoros foleyi (vector of tick-bite fever), O. tholozani (vector of relapsing fever), and Rhipicephalus sanguineus (vector of Mediterranean spotted fever). Hoogstraal and Kaiser expanded this knowledge by documenting 14 tick species from Libya. Despite these efforts, substantial gaps in research on ticks in the country have persisted.

Between 1987 and 1991, Beazley and Jabaj conducted a four-year survey on cattle, goats, sheep, and camels in Libya, during which they reported R. bursa, R. microplus, and R. decoloratus. However, the earlier record of R. bursa from Libya was later considered to be a misidentification. In 1992, a more comprehensive survey identified thirteen species of ixodid ticks and two species of argasid ticks across Libyan farms. These included R. annulatus, R. microplus, R. decoloratus, R. sanguineus, R. evertsi, R. bursa, Hyalomma anatolicum, H. excavatum, H. dromedarii, H. franchinii, H. impeltatum, H. rufipes, and H. turanicum, in addition to Ornithodoros tholozani and O. foleyi.

Camel ticks (H. dromedarii) were found in high abundance on camels, H. impeltatum predominated on sheep, and H. excavatum was common on cattle. Overall, the dromedary tick (H. dromedarii) was identified as the most widespread species in Libya. (Perveen, 2021)

Study methodology

1) Study Methodology

This study adopts a theoretical and descriptive-analytical methodology, focusing on the collection, review, and analysis of secondary data related to the prevalence of tick infestation in farm animals in Libya. Rather than conducting fieldwork, the study relies on previously published research, scientific reports, and relevant literature to build a comprehensive understanding of the issue.

2) Study Tools

The main tools used in this study are literature review and document analysis. These include textbooks, peer-reviewed journal articles, official reports from veterinary and agricultural institutions, and international databases.

3) Sources

Sources of data are entirely secondary, including:

- Academic studies and research papers related to ticks and ectoparasites in livestock.
- Veterinary and epidemiological reports from Libyan and international organizations.
- Books, theses, and dissertations addressing animal health and parasitology.
- Online scientific databases such as PubMed, Scopus, and Google Scholar.

4) Sample

Since this is a theoretical study, no direct animal sample is investigated. Instead, the "sample" refers to the body of literature and previous studies selected based on their relevance, credibility, and contribution to the topic.

5) Methods of Analysis

The study employs qualitative content analysis, through which data from previous studies are categorized, compared, and synthesized. Patterns and trends are identified to explain the prevalence, risk factors, and implications of tick infestation in Libya.

6) Limits of the Study

- Spatial Limit: The study focuses on farm animals in Libya.
- Thematic Limit: The study is restricted to tick infestation and does not address other ectoparasites.
- Temporal Limit: The review is limited to studies and reports published within the last two decades to ensure relevance.
- Methodological Limit: As a purely theoretical study, it does not include field surveys, laboratory analyses, or practical data collection.

Results

1) Studies consistently indicate that tick infestation is widespread among different species of farm animals in Libya, particularly in cattle, sheep, and camels.
2) Several tick species have been reported in Libyan livestock, with Hyalomma and Rhipicephalus being the most common and widely distributed.
3) Tick infestation shows clear seasonal variation, with higher rates recorded during warmer and more humid months, especially in spring and summer.
4) Literature shows that factors such as animal species, age, sex, geographic location, and management practices significantly influence infestation rates.
5) Tick infestation is strongly associated with decreased productivity, reduced milk and meat yield, and transmission of tick-borne diseases, which pose serious challenges to livestock health and economic sustainability in Libya.
6) Despite the available studies, there is a lack of comprehensive, updated, and systematic epidemiological data on tick prevalence across all Libyan regions, indicating the need for further research.

Recommendations

1) Establish a national surveillance system to monitor the prevalence and distribution of tick species across different regions of Libya.
2) Increase training and awareness programs for veterinarians and farmers on the identification of tick species, early detection, and proper control measures.
3) Encourage the adoption of integrated tick management programs combining chemical, biological, and environmental methods to reduce infestation rates.
4) Implement preventive strategies during peak seasons (spring and summer) when infestation is highest.
5) Promote better hygiene, regular inspection of animals, and pasture management to minimize the risk of tick infestation.
6) Support the development of governmental policies that provide farmers with access to affordable veterinary services and acaricides.
7) Encourage more epidemiological and molecular studies to provide updated, region-specific data on tick prevalence and tick-borne diseases in Libya.
8) Enhance cooperation with neighboring countries to exchange data and experiences in managing tick infestations and related diseases.

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