Araştırma Makalesi/Original Article
Makale Dili "İngilizce"/Article Language "English"

Türk Hijyen ve Deneysel Biyoloji Dergisi

Determination of the distribution of tick species in cattle in Çankırı (Province, Türkiye)

Çankırı ilindeki sığırlarda kene türlerinin dağılımının belirlenmesi

Banuçiçek YÜCESAN[1] (ID), Onur OKUR[2] (ID), Yusuf YILMAZ[3] (ID), Tuba BAYIR[4] (ID), Özcan ÖZKAN[5] (ID)

ABSTRACT

Objective: Ticks are arthropods found in many parts of the world that parasitize vertebrates, including livestock, wild animals, and humans. The distribution of tick in animals is an issue that needs to be taken into consideration as it also causes great economic losses. This study aims to detect ticks in the cattle population raised in Çankırı (province, Türkiye).

Methods: In this study, tick samples were collected from 150 cattle between June and October 2022. Tick samples (n=1196) were identified morphologically using a stereomicroscope.

Results: All collected ticks were adults, of these 516 (43.1%) were males and 680 (56.9%) females. With 845 (70.7%) specimens *Haemaphysalis punctata* was the most prevalent species, followed by *Dermacentor marginatus* 120 (10%), *R. sanguineus* 113 (9.4%). The least common tick type was *Ixodes ricinus* with 4 (0.3%), followed by *Rhipicephalus bursa* 9 (0.8%), and *Hyalomma marginatum* 9 (0.8%). There was a significant difference in terms of gender distribution between tick species (p<0.001), which was most

ÖZET

Amaç: Keneler, Dünya'nın birçok yerinde bulunan ve besi hayvanları, vahşi hayvanlar ve insanlar da dahil olmak üzere omurgalıları parazitleyen eklembacaklılardır. Kene popülasyonunun insanlar ve hayvanlar arasındaki dağılımı, büyük ekonomik kayıplara da yol açması nedeniyle dikkate alınmadır. Bu çalışma Çankırı ilinde yetiştirilen sığır popülasyonunda kenelerin tespitini amaçlamaktadır.

Yöntem: Bu çalışmada Haziran 2022 ile Ekim 2022 tarihleri arasında 150 sığırdan kene örnekleri toplandı. Keneler bir stereomikroskop kullanılarak morfolojik olarak teşhis edildi.

Bulgular: Toplanan kenenin tamamı yetişkin keneler olup, 516 (%43.1)'sı erkek, 680 (%56.9)'i dişiydi. En yüksek sıklığı *Haemaphysalis punctata* 845 (%70.7) tipi keneler oluşturmaktadır. Bundan sonra sırasıyla 120 (%10) *Dermacentor marginatus* ve 113 (%9.4) *Rhipicephalus sanguineus* türü sıklıkla görülmektedir. En az görülen kene türü 4 adet (%0.3) ile *Ixodes ricinus* olup, bunu 9 (%0,8) ile *Rhipicephalus bursa* ve 9 (%0.8) ile *Hyalommma marginatum* türleri takip etmektedir. Kene türleri

[1]Çankırı Karatekin University, Faculty of Health Science, Çankırı / Türkiye
[2]Çankırı Atkaracalar District, Directorate of Agriculture and Forestry, Çankırı / Türkiye
[3]Ministry of Health, Public Health General Directorate of Türkiye, Ankara / Türkiye
[4]Selçuk University, Faculty of Veterinary Medicine, Department of Biostatistics, Konya / Türkiye
[5]Çankırı Karatekin University, Faculty of Science, Department of Biology, Çankırı / Türkiye

İletişim / Corresponding Author : Banuçiçek YÜCESAN
Aksu mah. Sıhhiye Sok. No: 11 Çankırı - Türkiye
E-posta / E-mail : yucesanbanu@yahoo.com

Geliş Tarihi / Received : 18.02.2024
Kabul Tarihi / Accepted : 06.06.2024

DOI ID : 10.5505/TurkHijyen.2024.74152

Yücesan B, Okur O, Yılmaz Y, Bayır T, Özkan Ö. Determination of the distribution of tick species in cattle in Çankırı (Province, Türkiye). Turk Hij Den Biyol Derg, 2024; 81(2): 189 - 200

pronounced in the case of *R. sanguineus* where 75% of the specimens were females and 25% males. *R. sanguineus* was the most prevalent species in Cardaklı and Yakalı; *D. marginatus* in Budakpınar and Soğluk; while *Hae. puncatata* in Eyüpözü, Susuz, Kızılıbrık, Ilıpınar, Hüyük, and Bozkuş District. The most common ticks in Susuz and Kızılıbrık belonged to the genus *Haemaphysalis*.

Conclusion: This study contributed to health and economy by investigating the tick population in cattle. The distribution of ticks varies according to regions, climates and livestock activities. Since such studies have not been conducted in Çankırı before, we did not have the opportunity to compare with other studies. Prioritizing cattle has helped define the tick population in this region where animal husbandry is developed. By examining ticks, data was gained regionally in the fight against tick-borne diseases. In the study, the distribution of ticks between the Black Sea and Central Anatolia regions was examined and regional data was also obtained.

Key Words: Çankırı, cattle, tick, Türkiye

arasında cinsiyet dağılımı yönünden anlamlı derecede bir fark görülmüştür ($p<0,001$), bu farklılık görülme sıklığı gözönünde bulundurulduğunda en belirgin olarak *R. sanguineus* türünde %75 dişi, %25 erkek dağılımı şeklinde saptanmıştır. Çardaklı ve Yakalı'da *R. sanguineus*; Budakpınar ve Soğluk'da *D. marginatus*; Eyüpözü, Susuz, Kızılıbrık, Ilıpınar, Hüyük ve Bozkuş İlçesi'nde *Hae. punctata*'nın en yaygın kene türü olduğu belirlendi. Susuz ve Kızılıbrık'da en yaygın tür *Haemaphysalis* spp.'dir.

Sonuç: Bu çalışma sığırlarda kene popülasyonunun araştırılmasıyla sağlık ve ekonomiye katkı sağlamıştır. Kenelerin dağılımı bölgeler, iklimler, hayvancılık faaliyetleri açısından farklılık göstermektedir. Çankırı'da daha önce böyle çalışmalar yapılmadığından, karşılaştırma fırsatımız doğmamıştır. Sığırlara öncelik verilmesi hayvancılığın gelişmiş olduğu bu bölgede kene popülasyonunun tanımlanmasına yardımcı olmuştur. Keneler incelenerek bölgesel olarak, kene kaynaklı hastalıklarla mücadelede veriler kazanılmıştır. Çalışmada Karadeniz ve İç Anadolu bölgeleri arasındaki kenelerin dağılımı incelenmiş ve bölgesel veriler de elde edilmiştir.

Anahtar Kelimeler: Çankırı, kene, sığır, Türkiye

INTRODUCTION

Ticks are arthropods found in many parts of the world, parasitizing vertebrates, including livestock wild animal, and humans and can act as vectors of pathogenic or non-pathogenic microorganisms. Nowadays, more than 16 tick-borne human diseases and more than 19 tick-borne diseases of livestock and pets have been described (1,2). Ixodida consists of three families, Argasidae [~190], Ixodidae [~714], and Nuttalliellidae (1). A fourth family, Deinocrotonidae has been identified in fossil tick samples from amber deposits in Burma. Ticks have four stages in their life cycle: egg, larva, nymph and adult. Ticks at all life stages, with some exceptions, need to have a blood-meal (3).

In addition to the pathogens transmitted by ticks (4) to humans and animals, they also cause huge economic losses by reducing the development of animals and reducing productivity of meat and milk. Ticks are known to transmit diseases such as brucellosis, plague, salmonellosis, listeriosis, Luping-ill, Lyme disease, theileriosis, babesiosis, anaplasmosis, and Crimean-Congo hemorrhagic fever (5,6). It is also reported that poisoning and paralysis caused by ticks in humans and animals also occur in Türkiye (7).

With the increase in animal importation, there will be an increase and changes in the tick population coming to Türkiye on cattle. Thus, it is possible that

additional infective agents will be introduced to our country. For this reason, many studies have been conducted on the infections carried by ticks (8-13). In this context, it is also important to define the tick population in animals in Çankırı, Atkaracalar which has a large lifestock in the northern part of Türkiye, Çankırı. Atkaracalar is located in the transition zone between the Black Sea and Central Anatolia regions in terms of both climate and vegetation. Therefore, the distribution of ticks in this region is also important. In this study, it is aimed to identify ticks in the cattle population raised in Çankırı province.

MATERIAL and METHOD

Study Area

The population of Çankırı province is approximately 1.2 million. Çankırı is a province located in the Central Anatolia Region of Türkiye. The province, whose northern districts are in the Black Sea Region, is surrounded by Karabuk and Kastamonu in the North, Çorum in the east, Kırıkkale in the southeast. Ankara in the south and Bolu in the west. The surface area of the province is 7.542 km^2. Atkaracalar is a district of Çankırı province. The distance to Çankırı is 105 km. Atkaracalar District of Çankırı province is located in the northwest of Çankırı. It borders Kurşunlu in the east, Çerkeş in the west, Bayramören in the north-east, and Orta in the south (Fig 1). The east-west length of the district is approximately 7 km and the north-south length is 16 km. Its surface area is 486 km^2 and its altitude is 1,270 m. (http://atkaracalar.gov.tr/ilcemizin-cografi-yapisi). From the center to the South, changes and weakening of the climate and vegetation are observed. The Çankırı region is covered with bare mountains, and is under the threat of severe erosion. The main income source in the region is agriculture and animal husbandry and breeding.

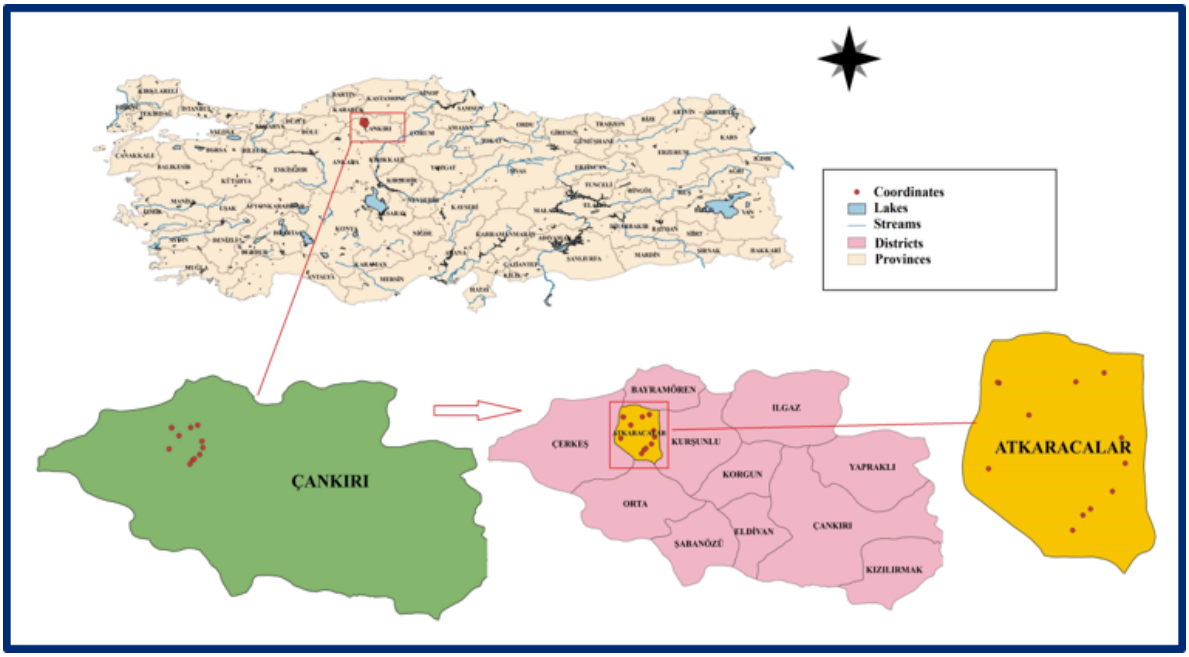

Figure 1. Study area

Sample Collection

Tick samples were collected from 150 cattle between June and October 2022. Morphological identification of tick samples (n = 1196) was carried out using the identification keys of Estrada-Peña et al. (2004) (14). Ticks were examined with a Leica MZ16A Stereo microscope (Wetzlar/Germany) and a Leica S6D Stereo microscope (Wetzlar/GermanyTicks were removed with a forceps and housed in vials with 96% ethanol. The cattle were selected from Çankırı, Atkaracalar region. Tick samples were sampled from infested cattle by collecting all ticks during an examination period of 30 minutes. A random sampling method regarding the sex and age of the animals was used.

Statistical analysis

Descriptive statistics of ticks in the study area were calculated as frequency and percentage. Statistical analysis were performed with the statistical software SPSS 23.01. Spatial analyzes were performed with QGIS 3.18.3 and SATScan 9.7 software.

RESULTS

Overall, 1,196 ticks were collected during the study period and all were adult specimens. Out of it, 516 (43.1%) were males and 680 (56.9%) were females. The most prevalent tick species was *Hae. punctata* (845, 70.7%), followed by *D. marginatus* (120, 10%) and *R. sanguineus* (113, 9.4%) (Table 1).

The least common tick species was Ixodes ricinus with 4 (0.3%), followed by *R. bursa* and *H. marginatum* with (0.8%) each. There was a significant difference in gender distribution between tick species ($p<0.001$), with the most pronounced species being *R. sanguineus*, where 75% of the specimens were females and 25% males. However, no significant relationship was detected between tick species and gender (Phi=0.221, $p>0.05$).

Table 1. Distribution of cattle ticks in Çankırı according to species and gender (n=1196)

Ticks	Gender		Total (n)	Total (%)
	Male (n/%)	Female (n/%)		
Rhipicephalus sanguineus	28/24.8	85/75.2	113	9.4
Rhipicephalus bursa	7/77.8	2/22.2	9	0.8
Haemaphysalis parva	18/33.3	36/66.7	54	4.5
Haemaphysalis sulcata	5/11.9	37/88.1	42	3.5
Haemaphysalis punctata	378/44.7	467/55.3	845	70.7
Hyalomma marginatum	8/88.9	1/11.1	9	0.8
Dermacentor marginatus	70/58.3	50/41.7	120	10
Ixodes ricinus	2/50.0	2/50.0	4	0.3
Total	516	680	1196	100

*Species distributions within tick lineages are presented by line percentage

In Table 2, tick samples collected from cattle in Çankırı province were evaluated on a species basis. The fact that the ticks in the study were collected more frequently from some regions, made statistical evaluation difficult. Instead, we evaluated ticks according to the gender. *R. sanguineus* in Çardaklı Municipality and Yakalı Village; *D. marginatus* in Budakpınar Village and in Soğluk Plateau; Eyüpözü Village, Susuz Village, Kızılıbrık Village, Ilıpınar Village, Hüyük Village, Bozkuş District, *Hae. punctata* were the most prevalent tick species. In Yakalı Village a statistical difference was found between the female occurrence rates in *R. sanguineus* and *D. marginatus* tick species ($p<0.001$). The most common strains in Susuz Village and Kızılıbrık Village were *Haemaphysalis* spp.

Table 2. Tick species frequency and gender distribution according to areas in Çankırı

Locality	Type	Gender		Total
		Male n (%)	Female n (%)	
Soğluk Plateau	*Haemaphysalis parva*	5/83.3	1/16.7	6
	Haemaphysalis punctata	51/50.0	51/50.0	102
	Hyalomma marginatum	0/0.0	1/100.0	1
Total		56/51.4	53/48.6	109
Çardaklı Municipality	*Rhipicephalus sanguineus*	23/48.9	24/51.1	47
	Rhipicephalus bursa	7/77.8	2/22.2	9
Total		30/53.6	26/46.4	56
Yakalı Village	*Rhipicephalus sanguineus*	4/6.2	61/93.8	65
	Dermacentor marginatus	1672.7	6/27.3	22
Total		20/23.0	67/77.0	87
Budakpınar Village	*Rhipicephalus sanguineus*	1/100.0	0/0.0	1
	Haemaphysalis parva	4/25.0	12/75.0	16
	Haemaphysalis punctata	1/33.3	2/66.7	3
	Dermacentor marginatus	28/60.9	18/39.1	46
Total		34/51.5	32/48.5	66
Eyüpözü Village	*Haemaphysalis parva*	3/15.0	17/85.0	20
	Haemaphysalis sulcata	4/10.3	35/89.7	39
	Haemaphysalis punctata	67/50.0	67/50.0	134
	Hyalomma marginatum	3/100.0	0/0.0	3
	Dermacentor marginatus	2/66.7	1/33.3	3
	Ixodes ricinus	2/50.0	2/50.0	4
Total		81/39.9	122/60.1	203

Table 2 (cont). Tick species frequency and gender distribution according to areas in Çankırı

Susuz Village	*Haemaphysalis parva*	3/42.9	4/57.1	7
	Haemaphysalis punctata	23/50.0	23/50.0	46
	Dermacentor marginatus	11/52.4	10/47.6	21
Total		37/50.0	37/50.0	74
Kızılıbrık Village	*Haemaphysalis parva*	3/60.0	2/40.0	5
	Haemaphysalis punctata	133/37.8	219/62.2	352
	Dermacentor marginatus	6/60.0	4/40.0	10
Total		142/38.7	225/61.3	367
Ilıpınar Village	*Haemaphysalis punctata*	52/50.0	52/50.0	104
	Hyalomma marginatum	4/100.0	0/0.0	4
	Dermacentor marginatus	00.0	1/100.0	1
Total		56/51.4	53/48.6	109
Hüyük Village	*Haemaphysalis punctata*	44/50.0	44/50.0	88
	Hyalomma marginatum	1/100.0	0/0.0	1
	Dermacentor marginatus	5/38.5	8/61.5	13
Total		50/49.0	52/51.0	102
Bozkuş District	*Haemaphysalis punctata*	8/42.1	11/57.9	19
	Dermacentor marginatus	2/50.0	2/50.0	4
Total		10/43.5	13/56.5	23

*Species distributions within tick lineages are presented by line percentage

Space-time cluster analysis

In this study, a retrospective space-time permutation scan statistic was used without the need for population-at-risk data. Space-time scan statistic was applied to see if types of ticks collected were significantly clustered in any particular places or times. SaTScan was employed to analyze the clustering (version 9.7. http://www.satscan.org). Here, a scanning window moving in space and time is the basic concept. The scanning window is cylindrical in shape. Its bottom circle's size corresponds to the area, while the height corresponds to time (15). The number of observed and expected cases is calculated for each window location and size. When more cases are observed (O) than expected (E), in the window a cluster is identified in space and time and its statistical significance is assessed applying the log-likelihood ratio (LLR). The corresponding p-value ($p<0.05$) is determined through 999 Monte Carlo replicates. The search was performed using circular spatial moving windows of variable size (maximum spatial cluster size: 50% of the study area and 20%). It is more useful to use variable window size when there is no a priori information about the size of the area occupied by the cluster (15). Similarly 20% to 50% of the study period were evaluated as the maximum temporal cluster size. The analyzes made

by taking the maximum spatial scan size of 50% and 20% of the study area and the maximum temporal window size of 50% and 20% were evaluated in detail (Fig. 2). Four important clusters were identified; two clusters contained one location (with a radius of less than 1 km). As a result of space-time analysis, the largest radius was determined as 8.03 km. This cluster contained a total of four locations. The center of the cluster was Susuz Village. The radius of the other cluster was 6.15 km. This cluster contained three locations. The center of the cluster was Yakalı Village. Clusters were also identified in Soğluk Plateau and Çardaklı Municipality (Fig. 1).

Analyzes were also performed by setting the temporal and spatial scan size to 20%. As the size of the spatial scanning window decreased, it was determined that there were clusters with a radius of less than 1 km and the cluster centers approached each other. Six important clusters were identified; five clusters contained one location (with a radius of less than 1 km). As a result of space-time analysis, the largest radius was determined as 3.67 km. This cluster contained a total of two locations. The center of the cluster was Hüyük Village (Fig. 2).

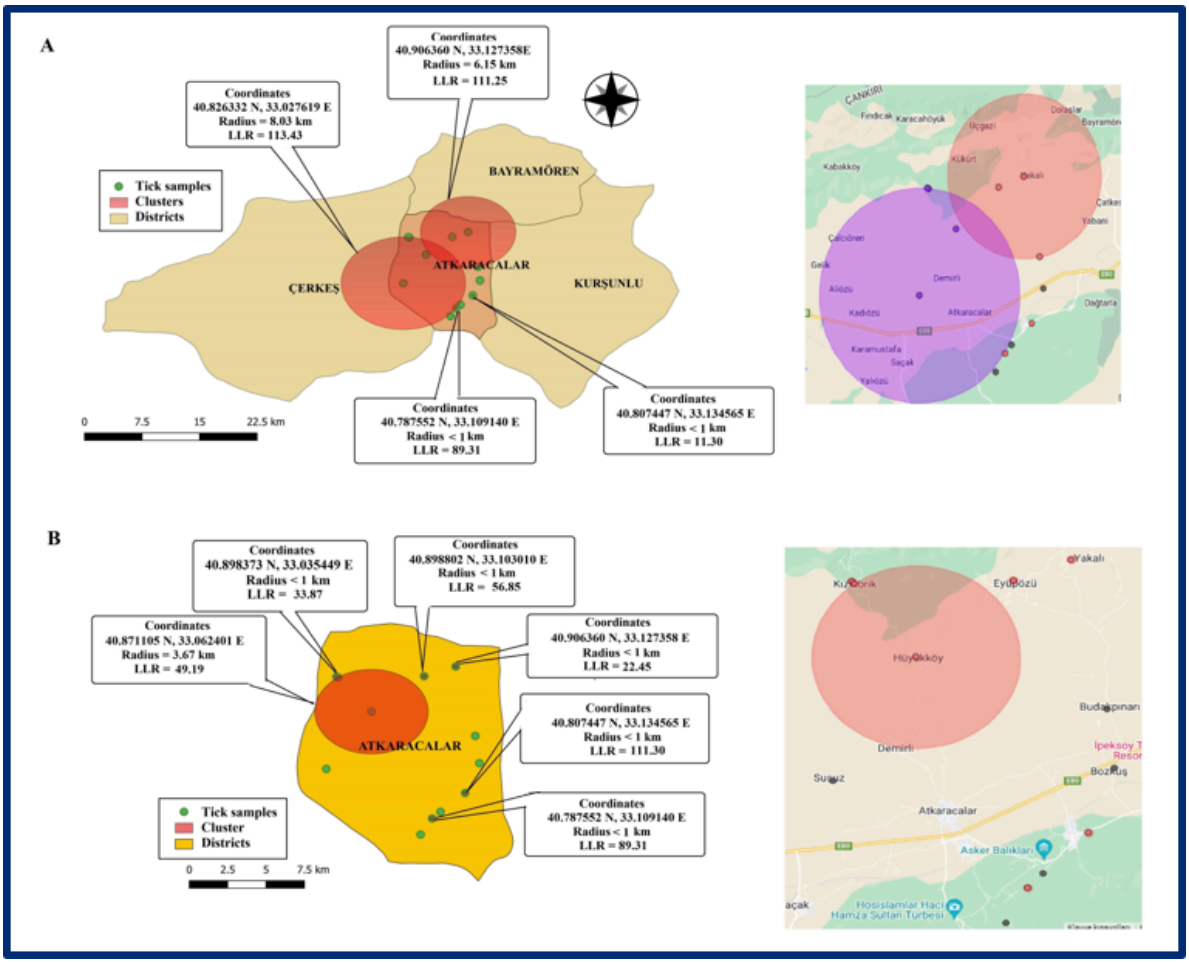

Figure 2. The detected space-time clusters A) maximum spatial window and maximum temporal window (50%), B) maximum spatial window and maximum temporal window (20%).

DISCUSSION

When it comes to animal husbandry in Türkiye, cattle and their products constitute an important part of the economy. Cattle are the source of an industry that provides great economic returns in terms of meat, milk and other products. Cattle dominate both commerce and industry. Any problems that may occur in cattle and need to be combated are reflected in our economy as monetary losses (16). Ticks are blood-sucking parasites that need to be addressed by medical and veterinary services because they are ectoparasites and have the potential to carry many bacterial, viral and parasitic agents. Their identification in cattle will support the livestock industry and reduce economic losses (17,18). Türkiye is a suitable country for different types of ticks to live due to the diversity in climate, vegetation and land structure.

Ten genera and 32 species belonging to the Ixodidae and Argasidae families have been described in Türkiye (19). In this study, 1,119 adult ticks belonging to the Ixodidae were collected from 150 infested cattle, and 8 species belonging to 5 genera were identified: *R. sanguineus*, *R. bursa*, *Hae. parva*, *Hae. sulcata*, *Hae. punctata*, *H. marginatum*, *D. marginatus* and *I. ricinus*. In this study, most ticks belonged to the genus *Haemaphysalis* (78.7%) and the least frequent ticks were *Ixodes* spp. (0.3%). In Çankırı region *R. sanguineus* (9.4%) was the most common among the *Rhipicephalus* spp. lineage, *Hae. punctata* (70.7%) was the most common among the *Haemaphysalis* spp. lineage, *H. marginatum* (0.8%) was detected in the *Hyalomma* spp. lineage, *D. marginatus* (10%) was detected in the *Dermacentor* spp. lineage, and *I. ricinus* (0.3%) was detected in the *Ixodes* spp. lineage.

In the previous cattle studies, three types of *Rhipicephalus* spp. have been identified in Türkiye: *R. turanicus*, *R. sangineus*, *R. bursa*. In Kayseri region, *R. turanicus* was the second most common tick species (20). This species was also the most common one reported in the study conducted in the Black Sea and Burdur regions (21,22). In Van and Erciş region, *R. bursa* constituted 25.6%, *R. turanicus* 9.8% and *R. sanguineus* 5.3% of the ticks collected from cattle (23). In this study, the most prevalent species in cattle was *R. sanguineus*. It is thought that this situation may be related to the fact that cattle ticks were collected in autumn.

It is known that *Haemaphysalis* spp. are commonly found in the autumn months on cattle in Türkiye (20). In the study conducted in Afyon, *Hae. parva*, *Hae. sulcata* and *Hae. punctata* were identified parasitizing cattle (24). In a study conducted Ankara region, the most prevalent ticks were *Hae. parva*, *Hae. punctata*, and *Hae. sulcata* (25). In a large-scale study conducted in Eastern Anatolia of Türkiye, *Hae. parva*, *Hae. sulcata* and *Hae. punctata* were identified (26), while only *Hae. punctata* has been described in cattle in the Burdur region (22). In a study conducted in cattle in the West Aegean Region, *Hae. parva* was observed in Izmir, while *Haemaphysalis* spp. had not been detected in Aydın and Manisa (27). In Kayseri, *Hae. parva* (2.78%) and *Hae. sulcata* (1.31%) were found (20). In our study, *Hae. punctata* (70.7%), *Hae. parva* (4.5%) and *Hae. sulcata* (3.5%) were detected, respectively. Although *Haemaphysalis* ticks are seen in all seasons, these three species were found to be the dominant species in the autumn months.

The most common *Hyalomma* spp. species in cattle in Türkiye are *H. marginatum*, *H. detritum*, *H. anatolicum*, *H. excavatum* and *H. aegyptium* (28). In the study conducted in Van and Erciş, *H. anatolicum* excavatum (8.5%), *H. marginatum* (4.5%), *H. a. anatolicum* (4.0%), *H. eagyptium* (2.4%) were found (22). In Elazıg, *H. marginatum*, *H. detritum* and *H. excavatum* species have been reported at different rates from different districts in cattle (29). In the study conducted in Kayseri, the second most common species in cattle was *H. a. anatolicum* (23.53%), followed by *H. a. excavatum* (1.14%) and *H. detritum* (1.96%) (20). Similar to our study, in Sivas (19.7%) and in Burdur (0.8%), only *H. marginatum* was detected in cattle (30,31). In the study conducted in Afyon, *H. marginatum* (26.36%),

H. detritum (1.13%), *H. excavatum* (0.37%), and *H. anatolicum* (0.54%) were found (24). In another study conducted in the West Aegean region, *H. anatolicum* (1.12%), *H. excavatum* (28.53%), *H. detritum* (32.16%), *H. marginatum* (0.63%), H. rufipes (0.22%), and *Hyalomma* spp. (0.08%) were detected in Manisa; *H. anatolicum* (0.32%), *H. excavatum* (14.61%), *H. detritum* (4.31%), *H. marginatum* (33.29%), H. rufipes (0.04%) were detected in Izmir; *H. anatolicum* (1.22%), *H. excavatum* (24.97%), *H. detritum* (17.51%), *H. marginatum* (47.71%) were detected in Aydın (27) in cattle. In our study, only *H. marginatum* (0.8%) was detected in cattle.

Dermacentor marginatus is seen in all regions of Türkiye in cattle, especially in winter and autumn. Since *Dermacentor* spp. are cold-resistant species, they are found in regions with cold climates (32). *D. marginatus* (25.2%) and *D. niveus* (6.9%) were found to be in cattle in Van and Erciş (23) and *D. marginatus* (5.88%) in the Southern Marmara region (33) in cattle. *D. marginatus* (2.8%) was found in Sivas (30) and *D. niveus* (12.76%) and *D. marginatus* (0.72%) were found in Afyon (24) in cattle. In this study, only *D. marginatus* (10%) was detected in cattle.

Ixodes species are also among the species frequently encountered in cattle in Türkiye (34). In a study conducted in the Southern Marmara region, it was reported that *I. ricinus* was common in cattle (33). In a study conducted on cattle ticks in the West Aegean region, *I. ricinus* (0.03%) was detected in Manisa and in Izmir (5.23%) (27) in cattle. In our study, only 0.3% of ticks found in cattle were *I. ricinus*.

In recent years, data obtained from studies in the field have been integrated into Geographical Information Systems (GIS) and spatial analysis studies have begun to increase considerably. Particularly data visualization, exploratory analysis methods and modeling applications. Spatial analysis, which is frequently used in the evaluation of the spatial epidemiology of epidemic animal diseases (35), has started to be used frequently in the distribution of ticks and tick diseases in recent years (36,37). In this study, the spatial clustering of ticks collected in the Atkaracalar district of Çankırı was demonstrated. Findings were shown that some tick species tend to cluster in certain areas of the district. In the identified clusters, especially *Haemaphysalis* spp. tick species were quite dominant. Likewise, in the analysis performed when the spatial and temporal window sizes were reduced, the most dominant tick species was *Haemaphysalis* spp. In this sense, the descriptive statistics obtained in the study were supported by cluster analysis, one of the exploratory spatial analysis methods.

The occurrence of tick species exhibits spatial clustering, which implies that their niches overlap geographically. The likelihood of many tick-borne diseases co-infecting livestock is suggested by the spatial overlaps observed in the regional distribution of various tick species.

The World Health Organization (WHO) reports that more than 17% of all infectious diseases are caused by vectors, and vector-borne diseases cause more than 700,000 deaths annually (38). Ticks are extremely important in terms of animal health and management. Although their species vary according to vegetation, land structure, climate and seasons, they are ectoparasites that affect humans, but especially cattle, and can cause many bacterial, viral, and parasitic diseases) (30). *Haemaphysalis* spp. could be vectors of *Coxiella burnetii*, *Francisella tularensis*, *Listeria monocytogenes*, Brucella, and the CCHF virus. *Hyalomma* spp. can transmit *Rickettsia*, *Brucella*, *Theileria*, West Nile virus, CCHF virus, *Coxiella*, and *Borrelia*. Pathogens transmitted by *Rhipicephalus* spp. include *Rickettsia*, *Anaplasma*, *Salmonell*a spp., *Ehrlichia*, *Haemobartonella*, *Babesia*, and *Leishmania*. Pathogens transmitted by *Ixodes* spp. include *Rickettsia, Coxiella, Anaplasma, Borrelia, F. tularensis*, and *Babesia*. Pathogens transmitted by *Dermacentor* spp. are *Rickettsia, Coxiella*, are *Babesia*. The pathogens transmitted by *Dermacentor* spp. are *Rickettsia, F. tularensis, Babesia, L. monocytogenes, Yersinia*,

and *Theileria* (39). The most common parasites in domestic animals in Turkey are *Babesia, Theileria* and *Anaplasma* (26). Therefore, domestic animals are gaining importance in terms of the distribution of zoonotic infections and public health (28).

This necessitates the use of an integrated strategy in regions where there are several tick species to combat the spread of diseases carried by ticks (37). Furthermore, the regional commonalities in tick vector habitats and clusters suggest the necessity for additional research to determine the shared sources of these ticks. Therefore, the findings of this study offer important information about the need for creative, spatially specified prevention and controlling methods for diseases carried by ticks in comparable ecosystems.

In conclusion; ticks are extremely important in human and animal health as carriers of various diseases. In this study, the tick population in cattle was investigated contributing to health and economic losses in the country. In this study, the distribution of ticks in the cattle population in Çankırı, a province where animal husbandry is carried out extensively, was examined. This information could provide important information in the fight against ticks and tick-borne diseases.

ETHICS COMMITTEE APPROVAL

* This study does not require Ethics Committee Approval.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

1. Zhang YK, Zhang XY, Liu JZ. Ticks (Acari: Ixodoidea) in China: Geographical distribution, host diversity, and specificity. Arch Insect Biochem Physiol, 2019; 102(3): e21544.

2. Zhao GP, Wang YX, Fan ZW, Ji Y, Liu MJ, Zhang WH, et al. Mapping ticks and tick-borne pathogens in China. Nat Commun, 2021; 12(1): 1075.

3. Beati L, Klompen H. Phylogeography of ticks (Acari: Ixodida). Annu Rev Entomol, 2019; 64: 379-97.

4. Kanji JN, Isaac A, Gregson D, Mierzejewski M, Shpeley D, Tomlin P, et al. Epidemiology of ticks submitted from human hosts in Alberta. Canada (2000–2019). Emerg Microbes Infec, 2022; 11(1): 284-92.

5. Yilmaz GR, Buzgan T, Irmak H, Safran A, Uzun R, Cevik MA, Torunoglu MA. The epidemiology of Crimean-Congo hemorrhagic fever in Turkey, 2002-2007. Int J Infect Dis, 2009; 13(3): 380-6.

6. Leblebicioglu H, Ozaras R, Irmak H, Sencan I. Crimean-Congo hemorrhagic fever in Turkey: Current status and future challenges. Antiviral Res, 2016; 126: 21-34.

7. Ozcel MA. Özcel'in Tıbbi Parazit Hastalıkları. İzmir: Türkiye Parazitoloji Derneği Yayınları, 2007; p.135-140

8. Aydin N, Vatansever Z, Arslan MO. Molecular Epidemiology of Babesia and Theileria Species in Sheep in Kars Region of Turkey. Turkish J Parasitol, 2022; 46(1): 20-8.

9. Bilgic HB, Bakırcı S, Kose O, Unlu AH, Hacılarlıoglu S, Eren H, et al. Prevalence of tick-borne haemoparasites in small ruminants in Turkey and diagnostic sensitivity of single-PCR and RLB. Parasit Vectors, 2017; 10(1): 1-13.

10. Bilgin Z, Turan N, Cizmecigil UY, Altan E, Esatgil MU, Yilmaz A, et al. Investigation of vector-borne viruses in ticks, mosquitos and ruminants in the Thrace District of Turkey. Vector Borne Zoonotic Dis, 2020; 20(9): 670-9.

11. Ceylan O, Byamukama B, Ceylan C, Galon EM, Liu M, Masatani T, et al. Tick-borne hemoparasites of sheep: a molecular research in Turkey. Pathogens, 2021; 10(2): 162.

12. Koseoğlu AE, Can H, Guvendi M, Erkunt Alak S, Kandemi Ç, Taskın , et al. Molecular investigation of bacterial and protozoal pathogens in ticks collected from different hosts in Turkey. Parasit Vectors, 2021; 14(1): 270.

13. Ozupak T, Albayrak H. Molecular detection of crimean-congo hemorrhagic fever virus (CCHFV) in tick samples but not in blood and milk samples of domestic ruminant species (cattle. sheep and goat) in northern Turkey. Polish J Vet Sci, 2020; 23(4).

14. Estrada-Peña A, Bouattour A, Camicas JL, Walker AR. Ticks of Domestic Animals in the Mediterranean Region. A Guide to Identification of Species. Zaragoza: University of Zaragoza Press. 2004.

15. Kulldorff M, Heffernan R, Hartman J, Assunção R, Mostashari F. A space-time permutation scan statistic for disease outbreak detection. PLoS Med, 2005; 2: e59.

16. Akhtar K, Anees R, Karim T, Gul SU, Rehman H, Ali A, et al. Prevalence of tick infestation in cows of various Regions of district Karak Pakistan. J Entomol Zool Stud, 2019; 7(2): 791-5.

17. Dumanlı N, Altay K, Aydın MF. Tick spesies of Cattle, Sheep and Goats in Turkey. J Vet Sci, 2012; 3(2): 67-72.

18. Muhammad A, Bashir R, Mahmood M, Afzal MS, Simsek S, Awan UA, et al. Epidemiology of Ectoparasites (Ticks. Lice. and Mites) in the Livestock of Pakistan: A Review. Frontiers Vet Sci, 2021; 8: 780738.

19. Bakirci S. Dıstrıbutıon of Tıck Specıes on Cattle in the Western Anatolia. Doktora Tezi. Uludağ Üniversitesi Sağlık Bilimleri Enstitüsü. Parazitoloji Anabilim Dalı, 2009.

20. Yay M, Yazar S, Aydın L, Sahin I. Investigation of Tick Species on Sheep and Cattle Around of Kayseri. Erciyes Üni Sağ Bil Derg, 2004; 13(2): 25-9.

21. Aydin L, Bakirci S. Geographical distribution of ticks in Turkey. Parasitol Res, 2007; 101: 163-6.

22. Yukari BA, Umur S. The Prevalance of Tick Species (Ixodoidea) in Cattle. Sheep and Goats in the Burdur Region. Turkey. Turk J Vet Ani Sci, 2002; 26(6)İ: 1263-70.

23. Yilmaz AB, Değer SM. Determination and Seasonal Distribution of Tick Species on Cattle and Sheep in the Van and Erciş Region. Yüzüncü Yıl Üni Vet Fak Derg 2011; 22(3): 133-7.

24. Eser M, Cicek H. Studies on tick (Ixodoidea) infestation in sheep, goats and cattle in Afyonkarahisar region. Kocatepe Vet J, 2018; 11(4): 385-93.

25. Cicek H. Epizootiological studies on Haemaphysalis ticks in Ankara province, Turkey. Turk J Vet Anim Sci, 2004; 28(1):107-13.

26. Deger MS, Bicek K, Oguz B. Infestation rate and distribution of hard ticks on cattle in the Eastern Anatolia Region of Turkey. Sci Parasitol, 2016; 17:76-82.

27. Bakirci S, Sarali H, Aydin L, Eren H, Karagenc T. Distribution and seasonal activity of tick species on cattle in the West Aegean region of Turkey. Exp Appl Acarol, 2012; 562):165-78.

28. Kucukyaglıoglu A, Uğur U. Determination and Prevalence of Ticks in Cattle in Konya Province of Turkey. Vet Sci Res, 2021; 3(1): 17-24.

29. Sayin F. Elazığ bölgesinde evcil hayvanlarda görülen kene (ixodoidea) türleri ile ilgili epizootiyolojik araştırmalar. Ankara Üni Vet Fak Derg, 1982; 29: (03.04).

30. Mamak N, Gencer L, Ozkanlar YE, Ozçelik S. Sivas-Zara yöresindeki sığır. koyun ve keçilerde kene türlerinin belirlenmesi ve sağaltımı. Türkiye Parazitol Derg, 2006; 30(3): 209-12.

31. Yukari BA, Umur S. The prevalance of tick species (Ixodoidea) in cattle. sheep and goats in the Burdur Region, Turkey. Turk J Vet Anim Sci, 2002; 26(6): 1263-70.

32. Mimioglu M. Türkiye'de ilk Amblyomma variegatum (Fabricius 1794) olayı. Ankara Üniv Vet Fak Derg, 1961; 239-40. Doi: 10.1501/Vetfak_0000001942

33. Aydın L. Güney Marmara Bölgesi Ruminantlarında Görülen Kene Türleri ve Yayılışları. Doktora Tezi. Uludağ Üniversitesi Sağlık Bilimleri Enstitüsü, 1994.

34. Bursali A, Keskin A, Tekin S. A review of the ticks (Acari: Ixodida) of Turkey: species diversity, hosts and geographical distribution. Exp Appl Acarol, 2012; 57: 91-104.

35. Bayir T, Gurcan I. Retrospective investigation of Newcastle disease reported in Türkiye between 2017-2019. Ankara Univ Vet Fak Derg, 2023; 70(2): 175-81.

36. Lippi CA, Ryan SJ, White AL, Gaff HD, Carlson CJ. Trends and Opportunities in Tick-Borne Disease Geography. J Med Entomol, 2021; 58(6): 2021-29.

37. Shekede MD, Chikerema SM, Spargo M, Gwitira I, Kusangaya S, Mazhindu AN, et al. Spatial clustering of fourteen tick species across districts of Zimbabwe. BMC Vet Res, 2021; 17(1): 91.

38. WHO (World Health Organization), Vector-born Diseases [internet]. Erişim: https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases [Erişim tarihi: 12 May 2024].

39. Yucesan B, Babur C, Sezen F, Nalbantoglu S. Ticks species biting humans in Ankara: Species diversity, hosts, and geographical distribution. Turk Hij Den Biyol Derg, 2019; 76(1): 3-14.