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Research Article

STUDIES ON DISTRIBUTION OF TICK GENERA AND THEIR PREVALENCE IN LATUR DISTRICT OF MAHARASHTRA STATE

***Dande K.G.**
Department of Dairy Science, Mahatma Basweshwar College, Latur-413512 India
**Author for Correspondence*

ABSTRACT
Livestock specifically cattle play an important role in the crop livestock mixed farming system. The majority of these cattle are indigenous *Bos indicus* breeds used for plough, transportation and to provide milk and meat. Ticks have great economic importance as the tick bite reduces up to 20 to 30 percent of skin and hide value. Besides the direct effect, ticks are important vectors for many pathogenic organisms than any other arthropod vectors. Therefore, present investigation was carried out to study the identification of tick genera and their prevalence in study area. Adult ticks in present investigation were collected from indigenous cattle breeds Deoni, Redkandhari, Khillar, Nondescript, and crossbred cattle. The representative samples of collected adult hard ticks were brought to the laboratory for their identification of genera on the basis of morphological characteristics. From the present investigation it is observed that the low prevalence of tick genera *Rhipicephalis* and *Haemaphisalis* in all taluka indicates that these tick genera show low activity at these latitudes and also altitude of dist Latur 300mt to 900mt from sea level. Tick genera *Boophilus* was observed more prevalent at high altitude 600 to 900 mt in taluka Latur, Ausa Nilanga, Shirur anantpal, Renapur and Chakur including Deoni (300-600mt). Similarly, tick genera *Hyalomma* was observed more prevalent at low altitude 300 to 600mt within the taluka Ahmedpur, Jalkot and Udgir.

Keywords: *Ixodid Ticks, Prevalence, Boophilus, Rhipicephalis and Haemaphisalis*

INTRODUCTION
Parasite distribution and dispersal between host populations is regarded as the most significant factor affecting the dynamics and evolution of host parasite interactions. The theoretical studies have already been demonstrated that the parasite disposal between two distinct host territories can play a vital role in the evolution of local adaptations. The capability of parasite to disperse always depends on various factors such as complexity of their lifecycle, parasite environment and presence of duration of free living stages. Parasites have a close relationship with the host, therefore, the opportunity for dispersal should also depends on mobility and characteristics of involved hosts. The ecological studies provide sufficient information for determining the levels of parasite infestation with quarantine procedures.
Ticks are distributed worldwide and had significant impact on animal health (Ghosh *et al.*, 2007). Ticks have great economic importance as the tick bite reduces up to 20 to 30 percent of skin and hide value (Biswas, 2003). Besides the direct effect, ticks are important vectors for many pathogenic organisms than any other arthropod vectors. DeCastro (1997) estimated the global cost of tick and tick borne diseases in cattle between US $ 13.9 and US $ 18.7 billion annually. In India alone, (Minjauw and McLeod, 2003) the cost of tick borne diseases in animals has been estimated as US $ 498.7 million (over Rs. 2000 crores) per annum. Similarly, Jiittapalapong *et al.*, (2004) reported that ticks are a problem in livestock production and cause significant economic losses, mainly in dairy cows. Snelson, (1975) and Rajput *et al.*, (2006) stated that ticks cause great economic loss.
About 70% of the people in India dependent upon agriculture. Agriculture sector is characterized to large extent by mixed farming system. Livestock specifically cattle play an important role in the crop livestock mixed farming system. The majority of these cattle are indigenous *Bos indicus* dairy breeds such as Deoni, Red Kandhaari, Khillari and Non descript cattle are the vital components and used for plough, transportation and to provide milk and meat. An introduction to *Bos taurus* dairy breeds and their cross with *Bos indicus* may increase the milk production, which may not be possible in the absence of good

management and control measures against parasitic control specifically for tick and tick borne diseases. Therefore, by considering the importance of parasite present investigation was carried out to study the identification of tick genera and their prevalence in Latur District of Maharashtra State

MATERIALS AND METHODS

Survey of Parasite (Hard Tick, Ixodidae)

Ticks are most important parasites of cattle in tropical countries like India. In the present investigation attempt was made to study adult hard ticks (*Ixodidae*) on the body of host cattle (Indigenous and crossbred cattle) from randomly selected places from ten taluka of district Latur.

Survey of Animal

Cattle are major collection sites (hosts) for hard ticks (*Ixodidae*). According to Livestock Census, (2003) Maharashtra state has 16737848 cattle heads. Out of which 13840286 are indigenous cattle and 2897562 exotic and cross breed cattle whereas district Latur has 368457 cattle heads, out of which 336484 are indigenous cattle and 31973 cross bred cattle.

In the present investigation cattle were observed in two groups

a) Indigenous cattle comprising descript breeds Deoni, Red Kandhari, Khillar and non-descript cattle.

b) Cross bred cattle including all type of crosses made between indigenous and exotic cattle breeds.

Cattle individuals from each group were observed from ten taluka in district Latur during the study period February 08 to January 09 to know the prevalence of ectoparasites adult hard ticks (*Ixodidae*) in relation to age, breed, season, geographical location, and status body condition and predilection sites on the body of cattle. A total number of 4000 indigenous and 4000 crossbred cattle were examined.

Survey Period

Period of successive twelve months from February 2008 to January2009 was taken into consideration for present investigation. This period was divided in three seasons as:

Summer season: February 2008 to May2008
Rainy season: June2008 to September2008
Winter season: October2008 to January2009

Collection of Ticks

Adult hard ticks were collected from various parts of the body of individual observed cattle host and placed in bottle containing enough 70 % ethanol. Ticks were collected from the cattle randomly while attending work camps and veterinary camps from time to time organized by the office of Deputy Commissioner Animal Husbandry, District Latur, Animal Husbandry Polyclinics, mini polyclinics in various places in ten taluka of district Latur. Cattle sheds and farms from villages of ten different taluka in district Latur were also visited for collection of ticks.

Prevalence of Adult Hard Tick (Ixodidae)

Prevalence of adult hard ticks (*Ixodidae*) on observed cattle host was studied with regards to season. Investigation was carried out for adult hard tick intensity on per observed cattle host season wise, district wise, taluka wise, age wise and breed wise.

Identification of Tick Genera and Prevalence

The representative samples of the collected ticks were brought to laboratory for their identification. Collected ticks were exposed to 10% KOH Solution and washed with distilled water and observed under stereoscopic microscope up to genera (Manan *et al.,* 2007) on the basis of morphological characteristics taking into consideration the key provided by Solusby, (1982), Geeverghese and Dhanda, (1995), Walker, *et al.,* (2007) confirmed from State Disease Investigation Section of Government Veterinary Department, Pune.

Statistical Analysis

The statistical analysis of the mean values was carried out as per Snedecor and Cochran, (1994). The data collected is tabulated in the form referring the entire district, taluka, breed, age group, season and is analyzed employing ANOVA for significance at 1% and 5% level.

RESULTS AND DISCUSSION

Table 2, indicates the percent of identified tick genera and their prevalence across different taluka of district Latur. The collected adult tick samples were brought to the laboratory for identification of tick genera. The tick genera *Boophilus, Hyalomma, Rhipicephalus* and *Haemaphysalis* recorded parasitic to cattle of district Latur under similar temperature.

Out of the total identified tick genera a relative humidity condition (Table, 1) of *Boophilus* (53.12%) and *Hyalomma* (39.26%) observed major highly prevalent genera as compared to less prevalent genera *Rhipicephalus* (7.26%) and *Haemaphysalis* (1.37%). Similar findings were reported by Kumar *et al.,* (1992) who observed highly significant prevalence of *Hylomma* and very low of *Rhipicephalus.* Lak *et al.,* (2008) also reported that the species of *Hyalomma anatolium* had highest frequency among hard tick in west Azarbajan.

The minimum and maximum prevalence percentage of identified tick genera in ten taluka of district Latur, accordingly was *Boophilus* 29.98% (taluka Jalkot) to %70.11% (Ausa), *Hyalomma* 19.7% (Ausa), to 63.81% (Jalkot) *Rhipicephalus* 1.01% (Deoni) to 9.92% (Renapur) and for *Haemaphysalis* 0.40% (Jalkot) to 2.01% (Renapur).

These findings on the genera spectrum of hard ticks corroborates with the findings of Rasul and Akhtar, (1975) found higher prevalence of *Hylomma* (4.5%) as compared to genus *Haemaphysalis* (0.22%). Durrani and Shakoori, (2009) recorded highest prevalence (67.0%) of ticks in district Lahore. They observed highest prevalence of (12.0%) of *Hyalomma* ticks and lowest prevalence (3.1%) of *Rhipicephalus* in cattle.

Shastri *et al.,* (1983) who also observed *Hyalomma, Boophilus, Haemaphysalis* and *Rhipicephalus* infesting cattle and buffaloes of Marathwada region of Maharashtra state. They further reported that the prevalence of hard tick genera *Hylomma* and *Boophilus* was dominant than *Haemaphysalis* and *Rhipicephalus.* Maske (1993) while studying on prevalence of Ixodid ticks of cattle in Vidarbha region of Maharashtra state observed *Boophilus, Rhipicephalus, Hyalomma* and *Haemaphysalis* infesting cattle. Shahardar *et al.,* (1998) found that adult *Ixodid* tick genera *Boophilus* (40%), *Haemaphysalis* (16.46%), *Hyalomma* (2.14%), *Ambhyoma* (10.22%), *Nosomma* (4.56%), *Rhipicephalus* (1.96%) infesting cattle and buffaloes from Konkan region of Maharashtra state.

These findings vary from the present investigation in the order of percent infestation whereas adult tick genera *Nosomma* and *Amblyomma* were not found infesting cattle from district Latur. Infestation of hard tick genera *Hyalomma, Boophilus, Haemaphysalis* and *Rhipicephalus* on cattle was also reported by MCarthy (1967), Bhat and Soman (1978), Ashok, (1988), Hiregoudar and Harlapur (1988), Hussain and Kumar (1989 and 1991), Khan *et al.,* (1993), Rahbari (1995), Kamal *et al.,* (1996), Acici and Celep (1997), Kumar *et al.,* (2002), Rajendran and Hafeez (2003), Deka *et al.,* (2005), Islam *et al.,* (2006), Manan *et al.,* (2007), Muhammad *et al.,* (2008), and Ramzan *et al.,* (2008). The prevalence percentage when compared amongst major tick genera *Boophilus* and *Hyalomma,* it was observed that taluka showing high prevalence percentage for *Boophilus* show low prevalence percentage for *Hyalomma* and vice versa.

The prevalence percentage of tick genera *Boophilus* was respectively more than *Hyalomma* in taluka Latur 61.14%, 29.17%, Ausa 70.11%, 19.72%, Renapur 55.23%, 32.84% Nilanga 68.71%, 31.81%, Shirur anantpal 56.32%, 32.89%, Chakur 65.13% 23.21% and Deoni 49.19%, 48.82% while prevalence percentage of tick genera *Hyualomma* was respectively more than *Boopohilus* in taluka Ahmedpur 59.17%, 30.17%, Jalkot 63.81%, 29.98% and Udgir 51.12%, 45.17%.

Tick genera *Boophilus* and *Hyalomma* observed widely distributed in all ten taluka with this geographical position located 17^0 52′ N to 18^0 50′ N latitude and longitude 76^0 18′ E to $79^0$12′ E. But *Boophilus* found more prevalent at low latitude Latur $18^0$40′N-$76^0$58′E, Ausa $18^0$15′N-$76^0$30′ Renapur 18 3′N-76 36′ E, Nilanga 18^0 06′ N-76^0 46′ E, Chakur 18^0 30′N-$76^0$53′ E, Deoni $18^0$15N-$77^0$06′E, except Shirur anantpal at high latitude $18^0$34′ N-$76^0$84′ E. Whereas *Hylomma* found more prevalent at high latitude Ahmedpur $18^0$42′ N-$76^0$56′ E, Jalkot $18^0$38′ N-$77^0$12′ E, Udgir $18^0$23′ N-$77^0$07′ E geographically positioned around Balaghat range.

Table, 1 Meteorological Data Related to Temperature (^{O}C) and Relative Humidity (%) of Latur District during the Study Period February 2008 to January 2009

Sr. No.	Month	Temperature (^{O}C)		Relative Humidity (%)	
		Minimum	Maximum	Morning	Evening
1.	February-2008	10.09	31.37	57.0	58.5
2.	March	14.14.	36.11	63.0	63.75
3.	April	20.1	37.23	54.0	53.75
4.	May	21.7	40.0	47.0	47.0
5.	June	22.0	38.06	52.60	52.80
6.	July	23.15	36.15	66.5	66.0
7.	August	20.85	33.45	75.0	77.0
8.	September	21.5	31.66	82.8	82.2
9.	October	18.18	32.14	69.8	70.2
10.	November	14.4	30.86	58.75	59.0
11.	December	12.0	31.25	74.0	72.25
12.	January- 2009	12.6	30.33	58.0	58.75

These differences in the percentage of parasite infestation of hard tick genera might be due to the fact that each taluka of district Latur is located geographically at various latitudes and altitudes under similar temperature and relative humidity conditions (Table 1).

Deka *et al.,* (2005) reported that geographical locations, climatic conditions affect tick prevalence and parasitosis. Cadnas and Burri (2008), Gilbert (2009) also observed the effect of altitude on tick densities. The shift of latitude distribution has been shown to be related to changeover in the suitable environment and tick activity.

These results of present investigation appeared to be in agreement with the findings of Gray *et al.,* (2009) who reported that shift in latitude distribution has been shown to related to tick survival activity and development which had a cleanest impact for tick establishment. Estrada-Pena (2008) reported that the quantification of species and environment relationship has long been fitness of set of climatic conditions for the existence of that population in the given region.

Table 2: Percentage of Identified Genera of Ticks from Different Taluka of District Latur

Sr. No.	Name of Taluka/Genera→ ↓	*Boophilus*	*Rhipicephalus*	*Hyalomma*	*Haemaphysalis*
1	Latur	61.14	8.19	29.17	1.50
2	Ausa	70.11	9.12	19.72	1.05
3	Renapur	55.23	9.92	32.84	2.01
4	Nilanga	68.71	8.31	31.81	1.17
5	S.Anantpal	56.32	9.15	32.89	1.64
6	Chakur	65.13	9.87	23.21	1.79
7	Ahmedpur	30.17	8.33	59.17	2.33
8	Jalkot	29.98	5.81	63.81	0.40
9	Udgir	45.17	2.91	51.12	0.80
10	Deoni	49.19	1.01	48.82	0.98
	Total	531.15	72.62	392.56	13.67
	Mean	53.12	7.26	39.26	1.37
	STD Deviation	13.7687	2.9003	14.5247	0.5619
	CV	25.9224	39.9385	37.0001	41.1065
	SE	4.3540	0.9172	4.5931	0.1777

ANOVA (For 5% Significance)					
Source of Variation	***SS***	***df***	***MS***	***F***	***F crit***
Rows	22.5000	9.0000	2.5000	0.0166	2.2501
Columns	18665.9209	3.0000	6221.9736	41.2737	2.9604
Error	4070.2285	27.0000	150.7492		
Total	22758.6494	39.0000			
ANOVA (For 1% Significance)					
Source of Variation	***SS***	***df***	***MS***	***F***	***F crit***
Rows	22.5000	9.0000	2.5000	0.0166	3.1494
Columns	18665.9209	3.0000	6221.9736	41.2737	4.6009
Error	4070.2285	27.0000	150.7492		
Total	22758.6494	39.0000			

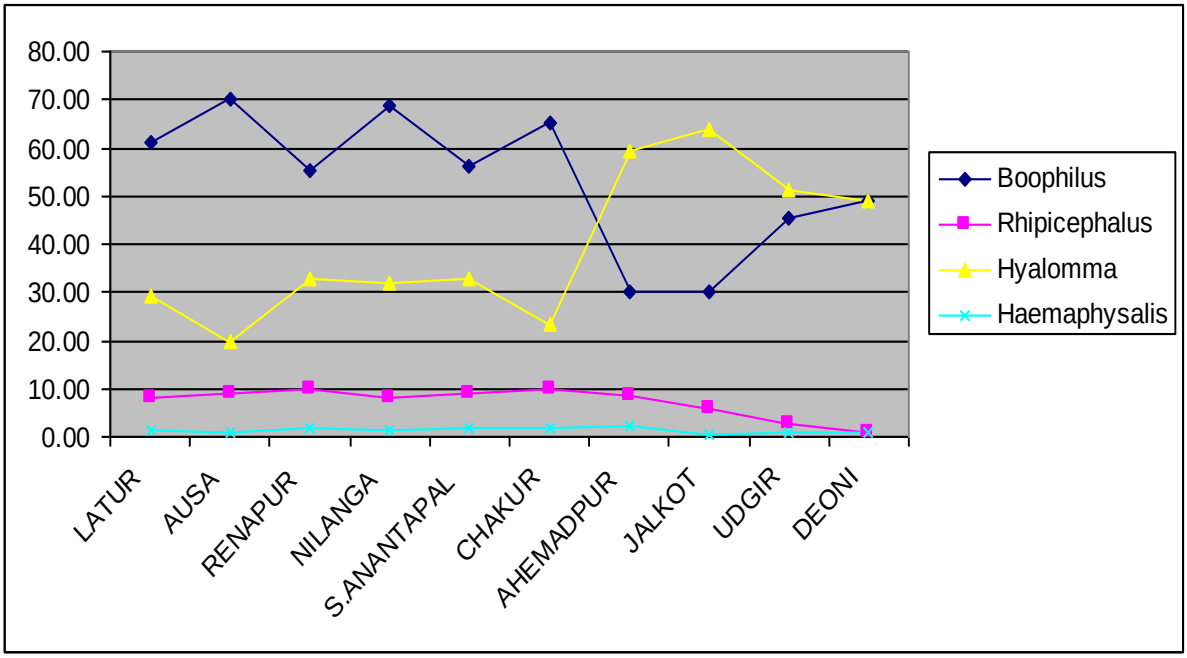

Figure 1: Percentage of Identified Genera of Ticks from Different Talka of District Latur

Muhammad *et al.*, (2009) also conducted survey to identify and to quantify variations in the prevalence of bovine tick infestation with respect to host age, species, breed and environmental determinants. They reported tick infestation was higher in cattle (79.2%) and Hylomma antolicum anatolicum was major tick species (33.5%).

Amongst minor genera of ticks *Rhipicephalus* observed respectively more prevalent than *Haemaphysalis* in all ten taluka of district Latur as Latur 8.19, 1.50%, Ausa 9.12, 1.05%, Renapur 9.92%, 2.01% Nilanga 8.31%, 1.17%, Shirur anantpal 9.15%, 1.64%, Chakur 9.87% 1.79% Ahmedpur 8.33%, 2.33%, Jalkot 5.81%, 0.40% Udgir 2.91%, 0.80% and Deoni 1.01%, 0.98%. The results obtained revealed the significant differences within the identified genera at both ($p<0.05$) and ($p<0.01$) level whereas talukawise differences among percentage of identified genera of ticks were observed significant at both 5 ($p<0.05$) and 1% ($p<0.01$) level.

District Latur belongs to Deccan platue and with low rain fall (612 mm during investigation period 2008-2009) resulting in small height of vegetation which could not sufficient for questing heights necessary for

sucking hosts by the ticks belonged to genera *Rhipicephalus* and *Haemaphysalis.* Importance of questing heights of vegetation was also reported by Shastri *et al.*, (1983), Kumar *et al.*, (2002), Geevarghese and Kanojia (2003), Tsunoda and Tatsuzawa (2004), Randolph (2004). The adults and immature instars of many tick species feed on different host species. Tick genera Boophilus generally described as one host tick, *Hyalomma* two host tick (Solusby, 1982 and Shourkry, 2000) whereas ticks belong to genera *Rhipicephalus* and *Haemaphysalis* generally described as three host ticks (Solusby, 1982 and Jongejan and Uillenberg, 2004). In the present investigation the observed less parasitic infestation of genera *Rhipicephalus* and *Haemaphysalis* because they might not have found appropriate intermediate host in all taluka of district Latur which resulted in the decrease in number. Randolph and Storey, (1999) reported the impact of microclimate and tick rodent interaction where for ticks rodents act as intermediatory host. High prevalence of ixodid ticks *Boophilus* and *Hylomma* and low prevalence of *Rhipicephalus* and *Haemaphysalis* in cattle might be due to host responses to these species. These findings corresponds with the observations of Miranpuri (1989) who reported that the cattle host response elicited to one species do not provide cross resistance to the second species.

Conclusion

In the present investigation, the comparison of data observed on Ixodid tick genera distribution with map in various taluka of district Latur enables the identification of natural distribution of area in relation to latitude and altitude. According to macro and micro climatic requirements of the ticks observed genera, they were found in similar bioclimatic area and not other. From the present investigation it is observed that the low prevalence of tick genera *Rhipicephalis* and *Haemaphisalis* in all taluka indicates that these tick genera show low activity at these latitudes and also altitude of dist Latur 300mt to 900mt from sea level. Tick genera *Boophilus* was observed more prevalent at high altitude 600 to 900 mt in taluka Latur, Ausa Nilanga, Shirur anantpal, Renapur and Chakur including Deoni (300-600mt). Similarly, tick genera *Hyalomma* was observed more prevalent at low altitude 300 to 600mt within the taluka Ahmedpur, Jalkot and Udgir.

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