

## RESEARCH ARTICLE

# Assessing the Prevalence of Hard Ticks in Dairy Cattle Across Diverse Agro-Climatic Zones of Western Maharashtra

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## ABSTRACT

This study investigated the prevalence of hard ticks infesting dairy cattle across four distinct agro-climatic zones in Western Maharashtra, India, shedding light on critical challenges in livestock management. From June to February, a thorough screening of 375 dairy cattle was conducted, with a meticulous collection of ticks from various regions of the body as well as from the surrounding environment. The findings revealed that out of 375, 200 animals were infested, indicating an alarming overall prevalence of 53.30%. Notably, calves under one year showed even greater susceptibility, with infestation rates soaring to 70.00%. Among different demographics, female cattle experienced higher infestation levels (54.60%; 160/293) compared to males (48.80%; 40/82). The prevalence in crossbred animals was 59.70% (12/206), non-descript breeds 45.70% (42/92), and in native breeds 45.50% (35/77). Cattle in poor body condition were disproportionately affected, exhibiting a striking 76.40% (81/106) infestation rate, in contrast to those in medium or good condition. Ticks favoured specific sites on the host, with the neck region (38.50%) and ears (15.50%) identified as the most common areas of infestation. This research underscores the urgent need for targeted control strategies to mitigate tick infestations in dairy cattle, particularly among vulnerable populations.

**Key words:** Cattle, Ixodidae, *Rhipicephalus microplus*, Tick prevalence, Western Maharashtra.

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## INTRODUCTION

Livestock is a cornerstone of India's agricultural landscape, with the dairy industry serving as a crucial pillar of the rural economy and a lifeline for countless farmers. As the world's leading milk producer, India achieved an astonishing output of 209.96 million tonnes milk production in 2020-21, driven by its substantial population of cattle and buffalo, totalling approximately 192 million and 109 million, respectively (BAHS, 2019). This highlights the immense contribution of the dairy sector to the nation's livestock ecosystem.

In an agriculture-dependent economy like India, cattle are indispensable, providing not only milk, meat, hide, and manure but also generating employment for farmers and livestock owners. However, dairy cattle are severely affected by various parasitic diseases that lead to significant losses in production and productivity (Sharma *et al.*, 2015). Notably, India is home to around 106 validated tick species, with *Rhipicephalus microplus* being the most prevalent and damaging (Singh *et al.*, 2000). This species poses a serious threat to livestock, zoos, and wildlife due to its role as a vector for dangerous pathogens, including *Babesia bigemina*, *Theileria annulata* and *Anaplasma marginale* (Sharma *et al.*, 2013; Kaur *et al.*, 2016; Ntesang *et al.*, 2024).

The financial toll of tick infestations is staggering; with milk production losses estimated at \$502.08 million and hide production losses reaching \$92.10 million, culminating in a total loss of \$595.07 million. Additionally, tick-borne diseases (TBD) account for an approximate loss of \$191.15 million,

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bringing the cumulative economic impact to a staggering \$786.63 million (Salih *et al.*, 2015). Alarmingly, each female tick can reduce milk production by as much as 8.9 mL (Hurtado and Giraldo-Ríos, 2018). Given these substantial losses, it is imperative to address the challenges posed by tick infestations in order to safeguard the health of dairy cattle

and ensure the sustainability of the dairy industry in India. Hence, the present study was aimed to assess the prevalence of hard ticks in dairy cattle across diverse agro-climatic zones of Western Maharashtra.

## MATERIALS AND METHODS

The study was conducted from June 2023 to February 2024 at Krantisinh Nana Patil College of Veterinary Sciences, Shirwal, and College of Veterinary Sciences, Parbhani, Maharashtra following ethical approval No. IAEC/09/23/KNPCVS/2024. Total of 375 dairy cattle were screened for tick infestation across four distinct agro-climatic zones of Western Maharashtra: the Western Ghat Zone, Sub-Montane Zone, Western Maharashtra Plain Zone, and Western Maharashtra Scarcity Zone, resulting in the identification of tick infestations in 200 animals.

Ticks were meticulously collected from various regions of the animal body including the neck, ears, brisket, back, ventral abdomen, and inguinal area. This was accomplished through careful handpicking or the use of forceps. The tick was firmly grasped by the head with forceps, then gently turned onto its back and swiftly pulled out at a perpendicular angle to minimize discomfort and ensure complete removal. Figure 1 shows ventral parts of female *Rhipicepalus microplus* and *Hyalomma* spp. Ticks were also collected from the surroundings of the animal shelters, targeting humid areas, cracks and crevices, and various locations such as gunny bags, gaps between rocks, un-plastered walls, and beneath the manger (Fig. 2).

Both animals and shed ticks were placed in collection bottles equipped with small holes for ventilation and appropriately labelled for identification. The collected ticks were then processed for identification based on morphological characteristics as outlined by Soulsby (1982) at the Department of Veterinary Parasitology, Shirwal. During the study period, the prevalence of Ixodid ticks was assessed alongside risk factors such as age, sex, breed, body condition score, and geographic location. The data was analysed using SPSS-20 software for percent frequency and tested for significance by using Chi-square test.

## RESULTS AND DISCUSSION

In present study, a thorough screening of 375 dairy cattle in Western Maharashtra revealed a concerning overall prevalence rate of 53.30 % (200/375) of tick infestation. The Chi-square test revealed a significantly different tick prevalence ( $p=0.026$ ) in Western Maharashtra in different agro-climatic zones, Sub-Montane Zone (62.50%) showed highest and the Scarcity Zone (42.40%) showed lowest prevalence (Table 1).

The tick prevalence varied significantly by age: animals below 1 year of age had a striking 70.00% prevalence, followed by those of 1-3 years (53.00%), and over 3 years (38.70%). These findings with respect to age were consistent

with previous studies by Jawale *et al.* (2012) and Mandloi *et al.* (2016). Emphasizing the vulnerability of calves and younger animals to tick infestations, it also corroborated with findings of Dehuri *et al.* (2017), Godara *et al.* (2018) and Jaliparthi *et al.* (2023). This higher susceptibility may stem from younger animals receiving less attention and limited acaricide treatment compared to adults, who benefit from better care and management practices. The current findings however did not align with reports of Sen *et al.* (2012), Mandloi *et al.* (2016) and Ghosh *et al.* (2019).

Among the 293 females and 82 males screened, female cattle had a higher infestation rate of 54.60% compared to 48.80% in males. This observation was similar with the studies of Sen *et al.* (2012), Dehuri *et al.* (2017), Kumar *et al.* (2020), Jaliparthi *et al.* (2023). and Shirsikar *et al.* (2023). This could be due to hormonal influences and the increased stress the female cattle experience from pregnancy and lactation, making them more susceptible to ticks.

When assessed by breed, crossbred cattle showed the highest prevalence of 59.70%, followed by local breeds (45.50%) and non-descript types (45.70%), which concurred with the findings of Jawale *et al.* (2012), Dehuri *et al.* (2017) and Shirsikar *et al.* (2023).

Body condition scores indicated that cattle in poor condition were most affected, with a prevalence rate of 76.40%, while those in medium body condition had prevalence rate of 48.90% and good conditions 24.00%. The study highlighted a significant correlation between poor body condition and tick infestation ( $p=0.00$ ), similar prevalence was observed by Sen *et al.* (2012), and Kemal *et al.* (2016). Additionally, flooring type of housing significantly influenced tick prevalence: Kaccha-floor sheds had an alarming infestation rate of 81.20%, compared to just 20.80% in Pakka-floor sheds.

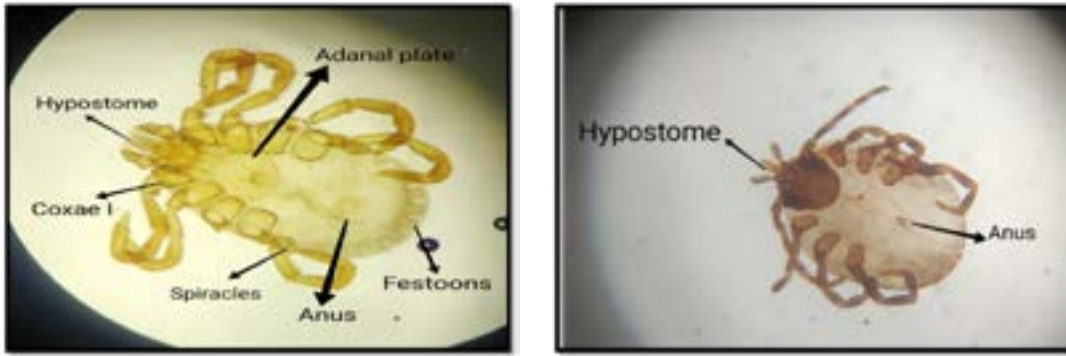
The analysis of tick distribution on the animal's body showed that the neck was the most heavily infested area, with an infestation rate of 38.50%. Other notable regions included the ear (15.50%) and perineum (12.00%). Infestations were also recorded in the udder (11.00%), belly (9.50%), dewlap (9.00%), and inguinal region (4.00%), with highly significant differences ( $p<0.001$ ). Location of ticks on the body confirmed established patterns.

Laboratory analysis of collected ticks from the four agro-climatic regions identified them primarily as *Rhipicephalus microplus* (78.50%), with *Hyalomma* species constituting 5.50%, and a mixed infestation of both species at 16.00%. *Rhipicephalus microplus* emerged as the predominant tick species, as noted in earlier studies, likely due to its ability to complete its life cycle on a single host.

## CONCLUSION

The study concludes that the overall prevalence of Ixodid ticks in cattle in Western Maharashtra was found to be 53.30%, with calves under one year showing the highest infestation rates. Females and crossbred animals were particularly affected, and *R. microplus* was identified as the most prevalent tick species.





**Fig. 1:** Ventral position of female *Rhipicepalus microplus* (A) and *Hyalomma* spp. (B) tick.



**Fig. 2:** (A) Ticks in cracks, (B) Ticks from shoulder region

**Table 1:** Cattle tick prevalence in Western Maharashtra according to zone, age, sex, home type and cattle breed

Factor	Criteria	Total animals screened	Positive animals	% prevalence	Chi-square value	P value
--	Overall	375	200	53.30	--	--
Agro-climatic zones	Western Ghat Zone	86	50	58.10	9.290	0.026*
	Sub Montane Zone	80	50	62.50		
	Western Maharashtra Plain Zone	91	50	54.90		
	Western Maharashtra Scarcity Zone	118	50	42.40		
Age group	Group I (< 1 yr)	100	70	70.00	20.666	0.00**
	Group II (1-3 yr)	111	43	53.00		
	Group III (> 3 yr)	164	87	38.70		
Sex	Female	293	160	54.60	0.847	0.350ns
	Male	82	40	48.80		
Breed type	Crossbreed	206	123	59.70	7.466	0.024*
	Native	77	35	45.50		
	Non-descript	92	42	45.70		
Body condition score	Good	50	12	24.00	41.738	0.00**
	Medium	219	107	48.90		
	Poor	106	81	76.40		
Shed type	Kaccha	202	164	81.20	136.499	0.00**
	Pakka	173	36	20.80		

\*ns- Non-significant; \*Significant p<0.05, \*\*Highly significant p<0.01.

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