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Vikram Punia
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

G Das
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

S Kumar
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

S Nath
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

R Verma
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

Manoj Kumar Dhaka
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

SK Pathak
Department of Veterinary Medicine, College of Veterinary Science and Animals Husbandry, Jabalpur, Madhya Pradesh, India

S Rakesh
Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, N.D.V.S.U, Jabalpur, Madhya Pradesh, India

Corresponding Author
Vikram Punia
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh, India

Incidence of tick infestations in cattle in Jabalpur district of Madhya Pradesh

Vikram Punia, G Das, S Kumar, S Nath, R Verma, Manoj Kumar Dhaka, SK Pathak and S Rakesh

Abstract
Ticks are obstinate ecto-parasites that inflict direct losses such as blood-sucking and disturbance of normal animal physiological functioning resulting in restlessness, stunted growth, weakness, reduced milk production, and indirect losses through the transfer of various pathogens in both animals and humans. The present study aimed to identify tick species on the cattle reared under organized and unorganized farms in the Jabalpur district of Madhya Pradesh. Ticks were collected from various infested animals, preserved in 70 per cent alcohol, mounted on slides, and identified microscopically. Three tick species were identified based on morphological characteristics *Hyalomma anatolicum*, *Rhipicephalus haemaphysaloides* and *Rhipicephalus* (B.) *microplus*. The present findings revealed that tick infestation is prevalent in the region and plays an important role in reducing animal productivity which required immediate intervention.

Keywords: *Rhipicephalus haemaphysaloides*, *Hyalomma anatolicum* and *Rhipicephalus* (B.) *microplus*

Introduction
Cattle play an important role in the agriculture-based Indian economy; especially in rural areas where they provide income to marginal, semi-marginal, and landless farmers. Cattle are being used for their milk, meat, hide, skins, and manure all across the world, including in India. Profitable cattle rearing are hampered by numerous constraints, the most significant of which are parasitic diseases. Ticks have been identified as the most significant ectoparasite constraint for optimum production in tropical and subtropical livestock (Jongejan and Uilenberg 2004) [4]. Ticks are obligate blood-feeding ectoparasites and transmit a variety of infections in vertebrate hosts which cause major constraints to livestock health and serious threats to the growth of the dairy industry. The impact of ticks in the cattle industry is attributed to a combination of direct and indirect effects. Direct effects include skin damage from tick bites, blood loss and toxicity from the bites, reduced animal weight gain, and reduced milk production. It is also estimated that a single female *Boophilus microplus* tick is responsible for the loss of 1.18 ± 0.21g body weight in crossbred cattle (Jonsson, 2006) [5]. The global loss due to ticks and tick-borne diseases (TTBDs) was estimated to be between US$ 13.9 and 18.7 billion annually while in India the cost of controlling TTBDs has been estimated as US$ 498.7 million/annum (Dehuri *et al*., 2017) [2]. Tick-borne infectious diseases are growing steadily partly due to the establishment of the tick vector in urban areas/new areas and posing a serious threat to world health problems. Today, most emerging infectious diseases are transmitted by ticks. Most competent and versatile vectors of pathogens and second to mosquitoes for human pathogens, like viruses, bacteria, rickettsia, protozoan, etc. and the most important vector of pathogens affecting animal's worldwide (Peter *et al*., 2005) [7]. Ticks transmit important haemoprotozoan diseases of livestock (Jongejan and Uilenberg, 2004) [4]. Recently, tick-borne diseases were again ranked high in terms of their impact on the livelihood of poor farming communities in developing countries. The present study aimed to identify tick species on the cattle reared under organized and unorganized farms in the Jabalpur district of Madhya Pradesh.

Materials and Methods
Study area
The study was conducted in the Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, (NDVSU), Jabalpur, (M.P.) to determine the morphological

details of cattle ticks collected from organized and unorganized farms in the Jabalpur district of Madhya Pradesh. All the animals were randomly selected as the sampling unit and were checked thoroughly for any tick infestation.

Collection of ticks

Ticks were collected from cattle and cattle sheds during morning hours in the summer and spring season. The specimens were randomly collected from the ear, brisket, lower abdomen, in between thigh, perineal region, the base of the tail and around the anus and were preserved in 70% alcohol. Fig. 1 showing ticks infestation in cattle.

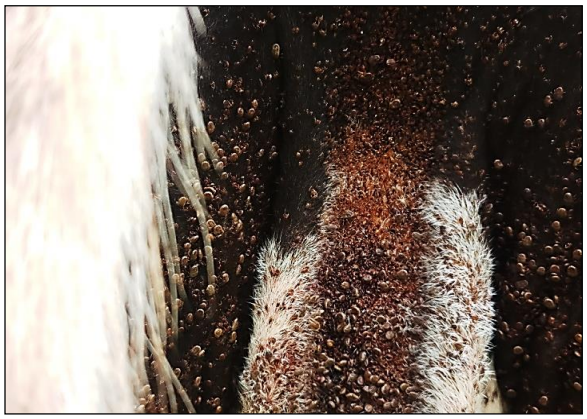

Fig 1: Cattle infested with ticks

Mounting of ticks

The mounting procedure was adopted as per Kumar *et al.* (2022). In brief, the ticks were kept in 10 per cent KOH and then heated intermittently for two minutes for liquefying the internal tissue. For engorged female ticks, the posterior margin of the body was punctured to ensure effective penetration of KOH. Consequently, the specimens were removed from KOH and internal liquefied tissues were removed from the body by pressing the dorsal surface slowly with the help of a pinhead. Dehydration of specimens was done by keeping for at least 10 minutes twice in each 30%, 50%, 70% and 90% and absolute alcohol and were cleared in cedar wood oil at least for 24 hours and placed in xylene for 1 minute. The ticks were mounted in Canada Balsam Mountain on a glass slide.

Results and Discussion

The permanent mounts of ticks were examined and identified as per keys of Soulsby, (1982) [10] and Sen and Fletcher, (1962) [8]. Based on morphological characters such as length of the mouthparts (the hypostome and palps) in relation to the basis capituli, presence/absence of eyes, shape and size of coxa, banding patterns on legs, shape of spiracles, ornate/inornate presence/absence of festoons, shape and location of the anal groove, and presence/absence of pale maculae (markings) on the dorsal shield, three ticks (*Rhipicephalus haemaphysaloides*, *Hyalomma anatolicum*, and *Rhipicephalus* (B.) *microplus*) were identified.

On the morphological observations the first species identified was *Rhipicephalus haemaphysaloides.* The ticks have spots on dorsal surface of the scutum and eyes were absent. The pedipalp was longer than chelicerae and no cornua on basis capituli. Auricles were small and dull. Coxa I was slender with internal spur that extends up to the front edge of coxa II but not behind it. Four trochanters and the other three coxae were also having spurs where each coxa was a slightly longer spur than that of each trochanter correspondingly. The genital plate was wider from the anterior to the posterior part. Anus has an inverse U-shaped pre-anal groove. There was a circular spiracular plate that is located on the ventro-lateral surface postero-laterally to the coxa IV. The adanal plate was dramatically wider in the anterior segment when compared to the posterior one.

The other species identified in the present study was the adult form of *Hyalomma anatolicum* (Bont legged ticks). As shown in Fig 2b. the mouthparts (hypostome and pedipalps) were long and finger-like. Capitulum is triangular dorsally. Eyes were present and round and generally glossy (Hyalos = glossy; omma = eyes). First Coxa was strongly bifid and 2nd, 3rd segments of pedipalps almost equal size. Spiracles were comma shaped in males and triangular in females. Festoons may be present which was usually inornate and legs are having a ring of white pigment at the end of segments (bont legged tick). Males have adanal and sometimes accessory adanal shields with pair of chitinous protrusions present at the posterior end.

The third species identified was adult form of *Rhipicephalus (B.) microplus* (Tropical cattle ticks). As shown in Fig 2c. the mouthparts of *R. microplus* were short and basis capituli hexagonal. Pedipalps have characteristic transverse ridges. Eyes were present but festoons were absent. The first coxa is with bifid. Spiracles were generally circular or oval. Males have adanal and accessory adanal shields and a caudal process at their posterior end. Anal groove absent in females and faint in males.

a) *Rhipicephalus haemaphysaloides* b) *Hyalomma anatolicum* c) *Rhipicephalus (B.) microplus*

Fig 2: Morpholgical details of Ticks

These ticks are well-known for their medical and veterinary importance. The distribution and abundance of tick species infesting cattle varies greatly from region to region. The hot and humid climate of the state, the immune status of animals and poor animal husbandry practices play a major role in the transmission of these ticks. During the present study three species of ticks, *Rhipicephalus haemaphysaloides*, *Rhipicephalus* (B.) *microplus* and *Hyalomma anatolicum* were identified in cattle. The findings are in accordance of Singh and Rath, 2018 [9] who concluded that *R.* (B.) *microplus* and *H. anatolicum* are the prevalent ixodid ticks of buffaloes of Punjab state however the former was the predominant one. Haque *et al.* (2011) [3] identified *Rhipicephalus* (B.) *microplus* and *Hyalomma anatolicum* in 8 districts of Punjab state. Admassu *et al.*, (2015) [1] studied the prevalence and identified the major ixodid tick genera of cattle in Dangila District, Awi Zone, North West Ethiopia, found *Amblyomma* spp., *Rhipicephalus* spp. and *Hyalomma* spp.

Conclusion

The results of the current investigation revealed that cattle throughout the study area have widespread tick infestation. It seems that the prevalence is high but many times overlooked and comes in the way of appropriate growth and welfare of the state's cattle industry. The adequate control strategies including use of appropriate acaricides at recommended concentrations and other managemental practices need to be carried out to control the tick infestation and optimize the livestock health and productivity so the economy of the farmers.

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Conflict of Interest

The authors declare that they do not have conflict of interest.

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