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ORIGINAL ARTICLE

Prevalence of ixodid ticks in dairy animals of Jammu region

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Abstract To determine the prevalence of ticks, 960 bovines (cattle 480, buffaloes 480) were examined from organised and unorganised dairy units of Jammu district during March 2012 to February 2013. The overall infestation rate was found to be 42.18 %. The infestation rate in cattle was found to be 47.08 % while 37.29 % of examined buffaloes were infested with ixodid ticks. Among the ixodid ticks, only one species i.e. *Rhipicephalus* (*Boophilus*) *microplus* was recorded. A significantly ($p < 0.05$) higher prevalence was recorded in monsoon season as compared to other seasons. Agewise, the animals aged <6 months showed the highest prevalence and the lowest was found in animals >1 year of age. Sexwise, the males had higher infestation rate than the females.

Keywords Buffaloes · Cattle · Jammu · Prevalence · *Rhipicephalus* (*Boophilus*) *microplus*

Introduction

Tick infestation in domestic animals is a common and serious problem in India responsible for substantial economic losses in terms of hide damage, loss of body weight and reduced production and transmission of various haematozoa (Minjauw and McLeod 2003; Ghosh et al. 2007; Vatsya et al. 2007; Haque et al. 2011a). Further the adult and larval ticks can suck 0.5–2.0 ml blood per day and cause mortalities in heavy infestations (Ram et al. 2004).

The prevalence and severity of ticks and tick-borne diseases in a particular geographical area depend upon the agro-climatic conditions, animal husbandry practices and pasture management, species involved, agents, host population, socioeconomic and technological advances in control measures (Solis 1991). The current information on regional prevalence is essential for development and modulation of control and curative measures for tick infestations which in turn will result in increase in production and economic stability. No concerted efforts have been made so far to study the prevalence of ixodid ticks infesting dairy animals of Jammu region. Therefore, the present study was planned to known the prevalence of ixodid ticks in dairy animals of Jammu.

Materials and methods

The study was conducted at Jammu district, Jammu and Kashmir (India), during March 2012 to February 2013. The study area is located 332–500 m above mean sea level (masl), between 74° 50′East longitude and 30° 40′North latitude.

Ticks were collected from 960 bovines (cattle 480, buffaloes 480) of organised and unorganised dairy farms. The animals of both sexes and all age groups were examined and each animal was considered as one sample. Ticks were searched by passing hands through the animal's coat and the different stages of ticks (larva, nymph and adult) were collected with the help of a forceps and brush without damaging their mouthparts. The collected ticks were then transferred to plastic tubes marked with age (i.e. <6 months, >6 month to 1 year and >1 year of age), sex (male/female) and species

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of bovines (cattle/buffalo). The vials were closed with muslin cloth to allow air and moisture exchange and were brought to the laboratory. Some of specimens were identified directly under stereomicroscope and some of the specimens were digested in 10 % KOH passed through different grades of ethanol (30, 50, 70, 80, 90 and 100 %) for dehydration. Dehydrated specimens were fixed in DPX and Canada balsam. Identification up to species level was made following identification keys and check lists authored by Soulsby (1982), Walker (1994).

The meteorological data were collected from Division of Agro-meteorology, Faculty of Agricultural Sciences, Chatha, Jammu (Fig. 1) and the prevalence of ticks during different seasons was correlated with these data. The study period divided into four seasons according to Indian Meteorological Department, Pune, viz. summer (March–June), monsoon (July–September), post-monsoon (October–November) and winter (December–February). The annual rainfall for the year March 2012–February 2013 was 1,124 mm. The mean relative humidity was ranged from 37.5 % in May to 80 % in August. The mean annual minimum and maximum temperature was 10.5 °C (January) and 31.4 °C (June), respectively.

The differences in the prevalence of ticks between species, seasons, age groups and sex were examined for significance by Chi square test (Snedecor and Cochran 1967) and were considered significant at $p < 0.05$.

Results and discussion

During the present study, a total of 960 animals (480 cattle, 480 buffaloes) were examined for the presence of adult, nymphs and larval stages of ixodid ticks from organised and unorganised dairy units in Jammu district. Out of that total, 405 (42.18 %) animals were found to be positive for tick infestations. The infestation rate in cattle was found to be 47.08 % (226/480), while 37.29 % (179/480) of examined buffaloes were infested with ixodid ticks. Among the ixodid ticks, only one species i.e. *Rhipicephalus microplus* was recorded. The month wise prevalence of ticks in cattle and buffaloes is presented in Fig. 2. Both in cattle and buffaloes, the highest prevalence was recorded in the month of August (62.5 and 52.5 %, respectively), whereas the lowest prevalence was found in January (30.0 and 25.0 %, respectively).

Vatsya et al. (2007) observed an overall prevalence rate of 40.67 % of *Boophilus microplus* on large ruminants at Pantnagar, Uttaranchal which is comparable to the present observations. On contrary to the present findings, Singh (2012) recorded an overall prevalence of 58.06 % of ixodid ticks of cattle from various agro-climatic regions consisting 18 districts of Punjab state. The management practices, including the use of acaricides and animal holdings influence the tick infestations on the body of the host. The animals maintained under extensive system of management and in smaller holdings (2–10 animals) often harbour low grade infestations on their body, as they are regularly removed by hand picking and burning or grooming of animals on return from grazing lands (Latha et al. 2004; Vatsya et al. 2008).

A significantly ($p < 0.05$) higher infestation rate in cattle than the buffaloes could be attributed to the dense hair coat on cattle, probably preferred by *R. microplus*, beside wallowing nature of buffaloes might cause dropping of ticks, resulting in lower infestation rate (Khan 1986).

The current study revealed only one species of ixodid ticks i.e. *R.* (*B.*) *microplus*, however, the concurrent

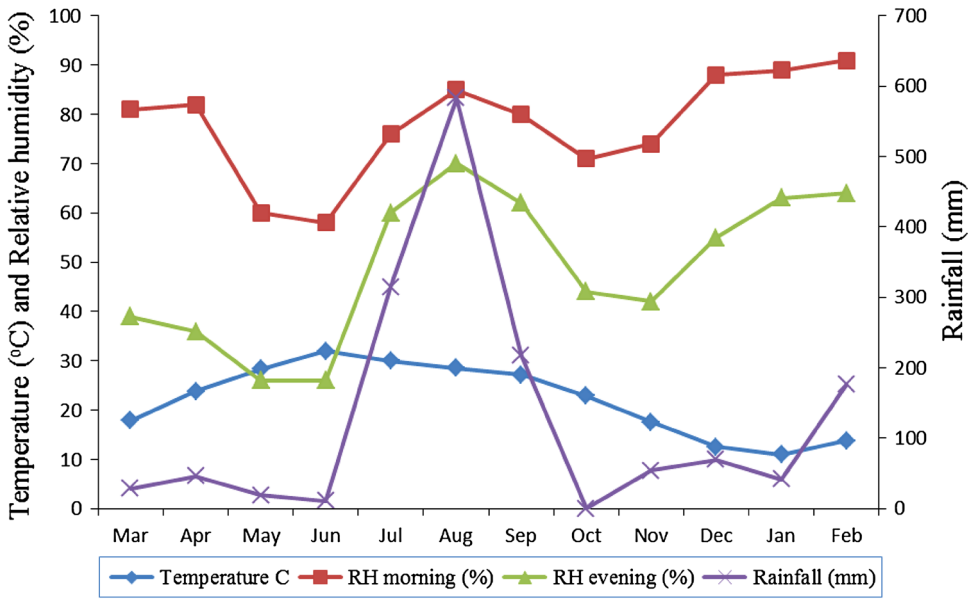

Fig. 1 Graphical representation of meteorological data of Jammu during March 2012 to February 2013

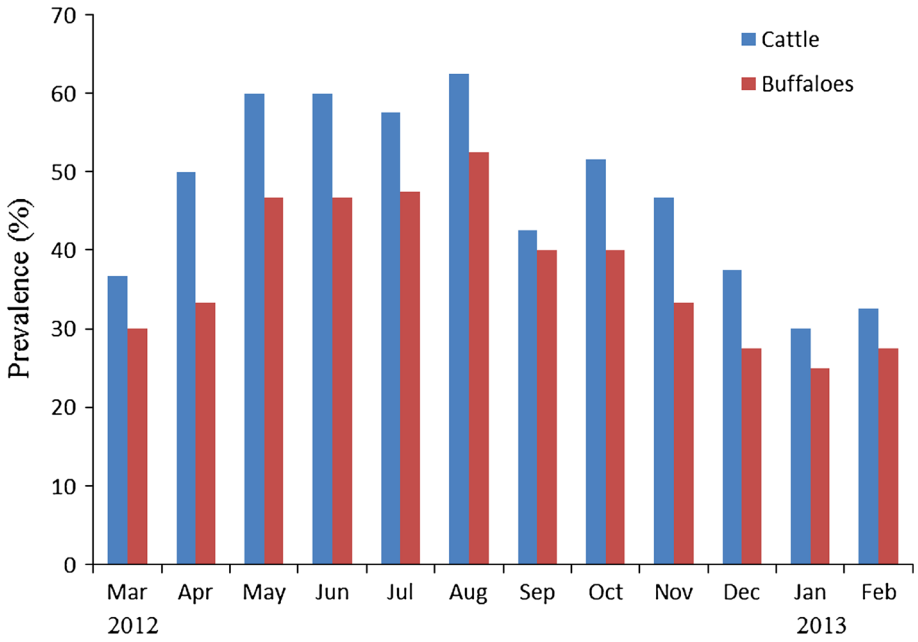

Fig. 2 Month wise prevalence of ticks on cattle and buffaloes

infestations are quiet common in animals reared under extensive and semi intensive managemental practices (Latha et al. 2004). Miranpuri (1988) recorded a total of 13 ixodid tick species from 424 buffaloes in the North-western states of India. The prevalence of ixodid tick species in an area is highly influenced by its macro as well as micro-climate and thus, the epidemiological pattern of ticks may be different in nearby agro-climatic regions. The presence of *R. microplus* could be attributed to high annual rainfall associated with high soil moisture as reported earlier (Ghai et al. 2008; Haque et al. 2011b). Recently, Singh (2012) reported *R. microplus* as the major tick species infesting cattle from sub-mountain undulating, undulating plain and central plain regions of Punjab state which have high annual rainfall with high soil moisture content.

There was marked seasonal fluctuations in the occurrence of infestation rate of ticks on bovines. The prevalence of *R. microplus* was the highest in monsoon season (50.4 %) followed by summer (45.4 %), post monsoon (42.9 %) and winter (30.0 %) seasons. It was statistically significant ($p < 0.05$) among the seasons. The majority of workers have reported rainy and summer seasons to be most conducive for development and propagation of ticks. During rainy season the epizootiological determinants such as ambient temperature and atmospheric humidity, and microclimate of grazing lands are optimally most favourable for feeding, breeding, growth and development of tick population in the surroundings, while lower ambient temperature (below 12 °C) with lower humidity during winter months do not favour propagation of ixodid ticks. Further, the ticks have ability to protect themselves against adverse climatic conditions and enter diapause, leading to delayed morphogenesis and reduced behavioural activities and they pass winters as engorged females, nymphs, larvae and unfed adults by hiding into the cracks and crevices in the walls (Gray 1991; Urquhart et al. 2003). It has also been suggested that female *B. microplus* has capabilities of converting its body weight to egg mass until the temperatures reaches a critical upper limit (Ouhelli et al. 1982; Davey 1988). The maximum egg production in *B. microplus* occurs at 25–30 °C and its egg production seized below 10 °C. However, humidity does not alter the oviposition much, but the shrinkage of eggs and failure of hatching occur between 20 and 40 % of humidity (Khan 1994). Moreover, the optimum temperature beside an average rainfall of more than 60 cm is essential to provide optimum humidity for faster propagation of ixodid cattle ticks, except for *Hyalomma* spp. ticks. In the current study region, the average temperature and relative humidity during this period were observed to be 28.56 °C and 72.16 %.

In the current study, it was observed that age of the animals had a profound effect on the prevalence of ticks in bovines. The animals aged < 6 months showed the highest prevalence (49.4 %) followed by 6 months–1 year (41.6 %) and >1 year (35.6 %) age groups. The infestation rate was statistically significant ($p < 0.01$) among the age groups. Singh (2012) also reported a significantly ($p < 0.01$) higher infestation rate in cattle <6 months of age (72.6 %) than 6 months–1 year age group (61.7 %) and >1 year age group (55.0 %). Similar observations have also been reported by Sangwan et al. (2000), Manan et al. (2007). The lower rate of tick infestations in adults could be attributed to acquired resistance incidental to repeatedly

exposer of host to low grade field infestations during the prolonged growth and development period (Mishra 1984; Das 1994). Moreover, the adults or the productive animals are provided utmost care with better animal husbandry practices, whereas the younger animals are least attended with limited use of acaricides, thus resulting in higher tick infestations (Singh 2012).

According to sex, the males had higher infestation rate (45.5 %) than the females (41.2 %). However, it was statistically not significant. It might be attributed to the fact that male animals are generally neglected and the owners provided the least care to them with occasional use of acaricides. Further, with the popularization of artificial insemination, the males are now considered useless by the farmers. However, Sutherst et al. (1983) reported higher infestation rate of ticks in females than the males and they suggested that the milch animals because of the hormonal stress carry more ticks.

The high level of tick prevalence in bovines of Jammu district is suggestive of that the geo-climatic conditions are highly conducive for the development and propagation of ixodid ticks, also poor animal husbandry practices followed by the farmers may be responsible for aggravating the condition. In order to effective control of tick infestations, acaricide treatment should be recommended twice in rainy season and once each in summer and winter seasons. The treatment of animal sheds including manger and the burning of floors of animal sheds for effective control should be recommended.

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