



Retrospective study on occurrence of tick borne haemoparasitic diseases in dairy animals of eastern Haryana

VANDNA BHANOT✉

Lala Lajpat Rai University of Veterinary and Animal Sciences, Haryana 125 011 India

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ABSTRACT

Tick borne haemoparasitic diseases (TBHDs) account for substantial losses in terms of decreased working capacity, growth and productivity of cattle. The occurrence of TBHDs in dairy animals of eastern Haryana was studied by screening 3,200 blood samples during the period of July 2014 to June 2019. The examination of stained blood smears from pyretic cross bred cows (2,339) and buffaloes (861) revealed significantly higher infection in cows (50.5%) than buffaloes (0.6%). Among the haemoprotozoan diseases, the occurrence of theileriosis in pyretic dairy animals was found to be high (32.6%), followed by anaplasmosis (2.4%) and babesiosis (2.0%). TBHDs were found most prevalent in summers (42.4%), followed by rainy season (38.3%) and least in winters (27.5%). Low Hb and TEC levels and increase in TLC count was noted in TBHDs affected animal as compared to healthy group. Year-wise, among haemoparasitic infection, particularly Theileriosis was higher during 2014–15 followed by decline in 2015–16 and later revealed increasing percentage of haemoparasitic infection in dairy animals every year.

Keywords: Anaplasmosis, *Babesia*, Haemoparasitic infection, Occurrence, *Theileria*

Tick borne blood parasitic diseases chiefly Theileriosis, Babesiosis and Anaplasmosis are considerable problem in dairy industry. Haemoprotozoan diseases are of great constraints to the dairy industry and cause severe losses to the livestock. Tick-borne diseases cause substantial losses to the livestock industry throughout the world (Ananda *et al.* 2009) as these have got a serious economic impact due to obvious reason of death, decreased productivity, lowered working efficiency (Uilenberg 1995), increased cost for control measures (Makala *et al.* 2003) and limited introduction of genetically improved cattle in an area (Radostits *et al.* 1994). The global loss due to ticks and tick-borne haemoparasitic diseases (TBHDs) has been estimated to be US\$ 498.7 million/annum (Minjauw and McLeod 2003). In India, haemoprotozoan diseases have been reported from different geographical regions.

The incidence of theileriosis was found to be 27.2% in cross-bred cattle with highest prevalence rate of 45.4% during rainy season in Dehradun district, Uttarakhand, India (Kohli *et al.* 2014). The overall incidences of haemoprotozoan diseases, theileriosis (37%), babesiosis (10.41%), anaplasmosis (2.82%) was recorded in crossbred cattle in Anand district of Gujarat, India (Vahora *et al.* 2012). In Northern Kerala, theileriosis and babesiosis have been reported as 16% and 0.6%, respectively in crossbred cattle (Nair *et al.* 2011). The present study was aimed to assess

the occurrence of haemoprotozoan infections and associated haematological changes in pyretic dairy animals of Eastern Haryana.

MATERIALS AND METHODS

A total of 3,200 (2,339 cattle and 861 buffalo) blood samples in anticoagulant vial from pyretic dairy animals from in and around Ambala presented at Disease investigation laboratory from July 2014 to June 2019 were examined. Blood smears were prepared on clean glass slides and stained with Giemsa stain by the standard technique. Smears were then fixed with methanol and stained with Giemsa's stain and examined under microscope (100 ×) with immersion oil for the presence of haemoprotozoan infections. The haemoprotozoan were identified to species level as per morphological characters described by Soulsby (1982). The results of haematological examination were compiled and analysed for a period of five years. The values with reference of haematological parameters (Hb, TEC and TLC) were compared between healthy (n=10) and affected groups (n=20). District Ambala is situated on the north eastern rim of the state of Haryana. It lies at 27–39°–45' north latitude and 74–33°–52' east longitude. Ambala has tropical as well as semi-arid climate. The seasons were broadly classified into winter (December, January, February), summer (April, May, June), rainy (July, August, September) and spring/autumn (October, November, March).

Present address: A.D.I.O, DI Lab, LUVAS, Ambala.

✉Corresponding author e-mail: vandna.van@gmail.com

RESULTS AND DISCUSSION

The study was conducted to notice the overall and seasonal occurrence of tick borne haemoprotozoan infection in dairy animals over a period of five years. Microscopic examination of 3,200 blood smears from dairy animals revealed 1,187 (37%) blood samples positive for blood parasites. The examination of Giemsa's stained blood smears (Fig. 1) from pyretic cross bred cows (2,339) and buffaloes (861) revealed significantly higher infection in cows (50.5%) than buffaloes (0.6%). Among the haemoprotozoan diseases, out of 861 buffalo blood samples examined anaplasmosis (0.23%) and babesiosis (0.34%) was noticed which was less as compared to crossbred cattle.

The buffaloes have usually been recorded with lower infection of haemoprotozoa than cross-bred cattle from Gujarat (Vohra *et al.* 2012). Previous studies from cross-bred cows of Northern India including Haryana (Yadav *et al.* 1985, Chaudhri *et al.* 2013), Punjab (Aulakh *et al.* 2005) and Himachal Pradesh (Jithendaran 1997), bovine calves of semi-arid region from Rajasthan (Godara *et al.* 2010), cattle from Northern Kerala (Nair *et al.* 2011) and crossbred cattle and buffaloes of Kaira and Anand districts of Gujarat (Vohra *et al.* 2012) showed that TBHDs are extensively prevalent in large population of dairy animals and thus adversely affect milk production to a larger extent. However, variation in geo-climatic condition, breed, and exposure of vectors and age of the animals might contribute to variable prevalence of haemoprotozoan diseases in the study areas (Muhanguzi *et al.* 2010). Amid the haemoprotozoan diseases, the occurrence of theileriosis in crossbred cattle was found to be high (44.6%), followed by anaplasmosis (3.4%) and babesiosis (2.6%). Chaudhri *et al.* (2013) and Ganguly *et al.* (2017), also recorded significantly higher infection of Theileriosis among haemoprotozoan diseases in pyretic cows of eastern Haryana. Theileriosis has been reported from various geographical regions of the country and recorded as 21.1% in Tamil Nadu (Anandan *et al.* 1989), 16% in Northern Kerala (Nair *et al.* 2011), 17.7% in Karnataka (Muraleedharan *et al.* 1994), 45.4% in Dehradun, Uttarakhand (Kohli *et al.* 2014) and 4.86% in Punjab (Mahajan *et al.* 2013) and fatal in nature. Haemoprotozoan

infection, particularly *Theileria* spp. infection was higher during 2014–15 followed by decline in 2015–16 and later revealed increasing percentage of haemoparasitic infection in dairy animals every year as also reported by Ganguly *et al.* (2017).

There is a distinguished seasonal variation with occurrence of haemoprotozoan infection. Notably higher percentage of haemoparasitic diseases was observed in summer (42.4%) followed by rainy and least in winter (27.5%). Further analysis of seasonal occurrence (Table 1) of haemoprotozoan diseases among cross bred cattle revealed of higher occurrence of *T. annulata* in summer (46.9%) and rainy (45%) season compared to winter (38.9%).

Velusamy *et al.* (2014) also reported theileriosis was found to be significantly high during summer (14.4%), followed by moderate in monsoon (13.8%) and less in fair seasons (11.5%). The present study is in accordance with the report of Chakraborty U (1993), from Ranchi, Bihar a

Table 1. Seasonal occurrence of tick borne haemoprotozoan infections in dairy animals of eastern Haryana (July, 2014 to June, 2019)

Animals exam. spp.	No. tested	<i>T. annulata</i>	<i>B. bigemina</i>	<i>A. marginale</i>
Rainy				
Cow	932	420 (45%)	16 (1.7%)	31 (3.3%)
Buffalo	291	0	1 (0.3%)	1 (0.3%)
Total	1,223	420 (34.3%)	17 (1.4%)	32 (0.26%)
Spring/Autumn				
Cow	374	160 (42.8%)	8 (2.1%)	12 (3.2%)
Buffalo	200	0	1 (0.5%)	1 (0.5%)
Total	574	160 (27.9%)	9 (1.6%)	13 (2.3%)
Winter				
Cow	252	98 (38.9%)	4 (1.6%)	7 (2.8%)
Buffalo	145	0	0	0
Total	397	98 (24.7%)	4 (1%)	7 (1.8%)
Summer				
Cow	781	366 (46.9%)	34 (4.4%)	26 (3.3%)
Buffalo	225	0	1 (0.4%)	0
Total	1,006	366 (36.4%)	35 (3.5%)	26 (2.6%)

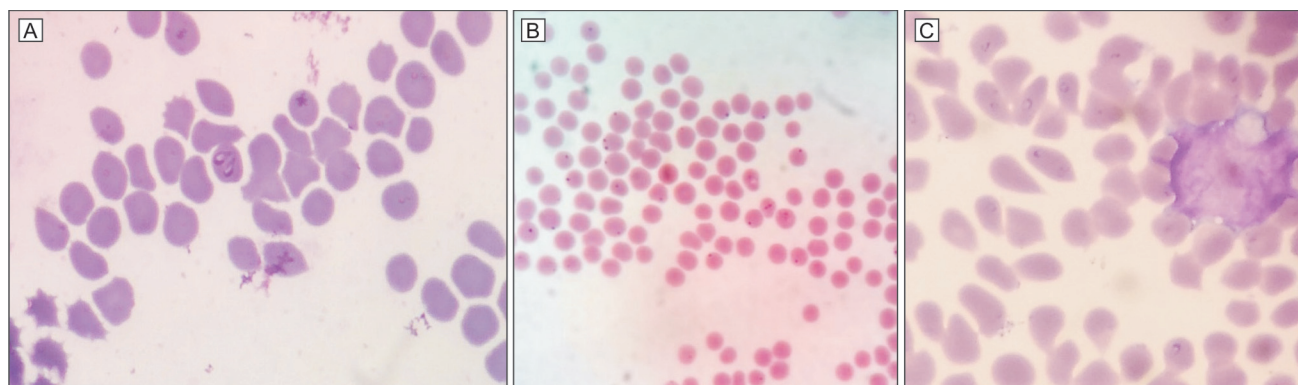


Fig. 1. Microscopic examination of Giemsa's stained blood smear (A) *Babesia bigemina*; (B) *Anaplasma marginale*; (C) *Theileria annulata*.

high prevalence of theileriosis was observed during summer (17.64%), followed by rainy (7.32%) and less in winter (5%). In contradiction to our findings, there are few reports (Radostiis *et al.* 1994, Roy *et al.* 2004 and Vahora *et al.* 2012) of higher prevalence of theileriosis during monsoon season. Ganguly *et al.* (2017) also reported significantly higher prevalence of *T. annulata* was recorded in rainy (37.26%) and summer (32.49%) and less in winter (26.61%). *B. bigemina* and *A. marginale* infection was also observed highest during summer season and least in winter season (Table 1). High prevalence can be correlated to the high activity of their tick vectors during summer and rainy seasons (Sangwan *et al.* 1995, Anandan *et al.* 2009 and Vohra *et al.* 2012).

The values with reference of haematological parameters Mean $\pm$ S.E. (Hb, TEC $\times 10^6$ and TLC $\times 10^3$) were compared between healthy and affected groups. Low Hb (6.28 $\pm$ 0.341) and TEC (3.94 $\pm$ 0.326) levels and increase in TLC (10.185 $\pm$ 0.503) count as compared to healthy animals (Hb- 11.15 $\pm$ 0.3727; TEC- 65 $\pm$ 0.317; TLC- 6.2 $\pm$ 0.448) was noted.

This persistent loss of blood caused by permanent blood sucking ticks leading to anaemia due to lower levels of Hb, PCV, TEC and TLC count (Durani *et al.* 2008) and replication of piroplasms in infected erythrocytes resulting lysis of erythrocytes leading to erythrophagocytosis (Modi *et al.* 2015). The decreased erythrocyte counts could also be attributed to increased levels of activated complement products (Omer *et al.* 2003, Khan *et al.* 2011). According to Mbassa *et al.* (1994) these changes in haemogram occur due to anaemia which takes place due to toxic metabolites of tick-borne haemoprotozoa which have adverse effect on bone marrow as they intervene with the process of erythropoiesis. The alteration in haematological parameters observed during the infection are in agreement with the findings of Ganguly *et al.* (2017).

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