

Prevalence of haemoprotozoan diseases of cattle in and around Tirunelveli district of Tamil Nadu - A retrospective study

A. Meenakshisundaram^{1*}, T. Anna¹ and K. Sumathi¹

¹Department of Veterinary Parasitology, Veterinary College and Research Institute, Tirunelveli- 627 358, Tamil Nadu, India

Abstract

Haemoprotozoan parasites have a great impact on dairy animal health and account for huge economic losses in terms of decreased milk production and reduced drafting power. Effective preventive measures against these parasites largely rely on accurate disease forecasting system, for which the pattern of disease occurrence over a particular period of time is essential. The current study was aimed at documenting the seasonal occurrence of haemoprotozoan infection of Jersey and HF crossbred cattle in and around Tirunelveli district of Tamil Nadu, India. A total of 376 blood smears from cattle suspected for haemoprotozoan diseases with a history of pyrexia, anaemia, lymph node swelling, presence of ticks and drop in milk yield were received over a period of 6 years from January 2013 to December 2018 at the Department of Veterinary Parasitology were screened for blood parasites. The overall prevalence of haemoprotozoan parasites is 16.76%. Amid 63 positive samples, *Theileria annulata* is the most prevalent (6.91%), followed by *Anaplasma marginale* (4.52%), *Babesia bigemina* (2.93%) and mixed infection 2.39%. The seasonal prevalence was highest during summer followed in order by monsoon and winter. Among the haemoprotozoan parasites, *Theileria annulata* was the most prevalent parasite in all the seasons except for south west monsoon, wherein *Anaplasma marginale* became more prevalent. The outcome of the present study would help to forecast disease outbreaks not only in this region and also in southern districts of Tamil Nadu, thereby improving the farmer's livelihood.

Keywords: Jersey and HF crossbred cattle, Protozoan parasites, Seasonal prevalence, Tirunelveli

Highlights

- The overall prevalence of haemoprotozoan parasites is 16.76 per cent.
- *Theileria annulata* is the most prevalent haemoprotozoan parasite affecting cattle.
- The seasonal prevalence was highest during summer, followed in order by monsoon and winter.

INTRODUCTION

Due to the changing environmental and climatic conditions, animal husbandry, a sub-sector of agriculture has now developed into an alternative to agriculture. Among the livestock enterprises, dairy industry, which spawned the white revolution, has grown into a major industry with modern technology. It is no exaggeration to say that the contribution of crossbred cows in the white revolution is immense. Such crossbred cows are susceptible to various viral, bacterial and parasitic diseases. Among the parasites, haemoprotozoa, the most important group of unicellular parasites, pose a major threat to the dairy industry throughout the world. These protozoan parasites have a great impact on dairy animal health and account

for huge economic losses. The annual estimated economic losses due to bovine tropical theileriosis alone in India is USD384.3 million (Rajendran and Ray, 2014), whereas losses due to babesiosis and anaplasmosis were about US\$57 million in India (Anwar, 2018). Clinically haemoprotozoan disease is manifested as fever, anorexia, anaemia, emaciation, and threatened abortion (Maharana *et al.*, 2016), and if the affected animals are not taken care of properly, they use to succumb to disease (Maharana *et al.*, 2016). Effective preventive measures against haemoprotozoan diseases largely rely on accurate disease forecasting system, for which the pattern of disease occurrence over a particular period of time is essential. Hence, this study was aimed

*Corresponding Author, E-mail: fish1092@rediffmail.com

at documenting the seasonal occurrence of haemoprotozoan infection of cattle in and around Tirunelveli district of Tamil Nadu, India over a period of six years.

MATERIALS AND METHODS

Study area: Blood smears of female crossbred Jersey and Holstein Friesian cattle aged between two to five years were received from the Veterinary Clinical Complex of Veterinary College, Tirunelveli and nearby veterinary dispensaries in and around Tirunelveli area. The district is located in the southern part of Tamil Nadu. It lies between 8°05' and 9°30' of the Northern latitude and 77°05' and 78°25' of East longitude. The climate here is tropical. The temperature typically varies from 70°F to 90°F with an average annual temperature of 81.4°F (27.5°C). The annual rainfall is 968 mm (38.1 inches). The season in this area can be broadly classified into summer from March to May, south west monsoon season from June to September, north east monsoon from October to December and the winter season from January and February.

Study period: The data recorded in the specimen register of the department of Veterinary Parasitology were compiled and analyzed for a period of 6 years from January 2013 to December 2018.

Sample size: A total of 376 blood smears were received from the Veterinary Clinical Complex of Veterinary College, Tirunelveli and nearby veterinary dispensaries in and around Tirunelveli.

Blood smear examination: The blood smears were fixed with methanol for 5 minutes and stained with Giemsa's stain for 30 minutes. Stained thin blood smears were examined under

the oil immersion (100x magnification) objective of the microscope (Zafar *et al.*, 2006; Qayyum *et al.*, 2010). The haemoprotozoan parasites were identified based on the peculiar morphological characters described by Soulsby (1982). A minimum of 50 fields were screened under oil immersion before proclaiming negative for any blood parasites. Even the presence of a single piroplasm was considered as a positive case.

RESULTS

The retrospective analysis of data was conducted to document the seasonal occurrence of haemoprotozoan infections in dairy animals in and around Tirunelveli over a period of six years from 2013 to 2018 (Table 1). Out of the total 376 blood smears screened, 63 samples were positive for haemoprotozoan parasites (Fig. 1, Fig. 2, Fig. 3) with an overall prevalence of 16.76%. Among the haemoprotozoan parasites, *Theileria annulata* was the most prevalent haemoparasite (6.91%) followed by *Anaplasma marginale* (4.52%), while *Babesia bigemina* was the least prevalent (2.93%). The presence of mixed infections was also observed in 2.39% of the cases.

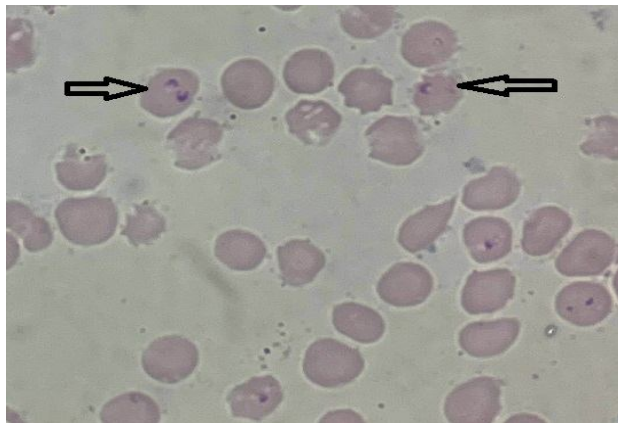
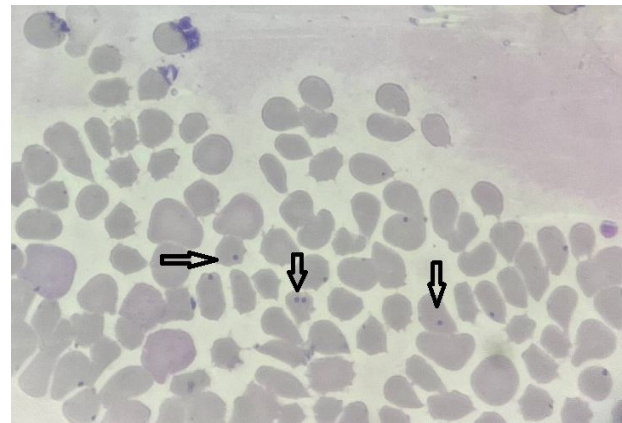
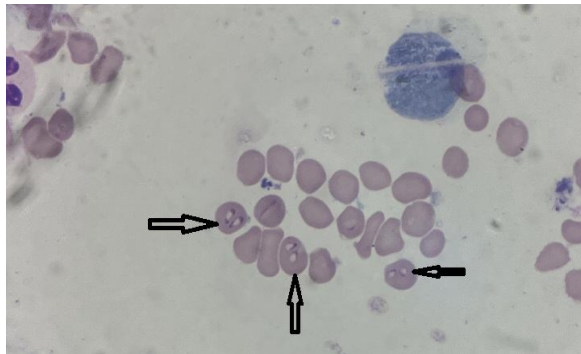
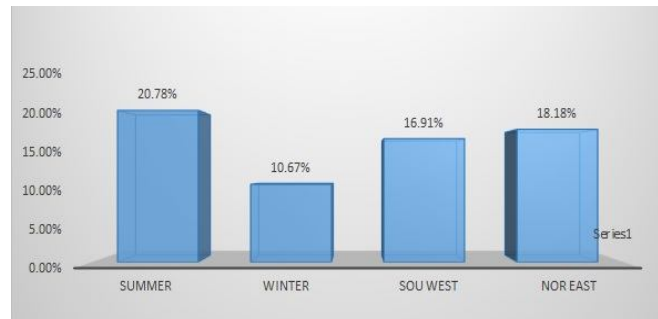
There was a seasonal fluctuation in the occurrence of haemoprotozoan diseases. Notably high prevalence of haemoparasites was reported during summer season, followed in order by north east and south west monsoon months, with the lowest prevalence in winter. Among the haemoprotozoan parasites, *Theileria annulata* was the most prevalent parasite in all the seasons except for south west monsoon wherein *Anaplasma marginale* became more prevalent (Table 2, Fig. 4).

Table 1. Overall prevalence (n=63) of haemoprotozoan parasites of cattle

Year	Smears screened	Positivity				
		Total	<i>Theileria annulata</i>	<i>Babesia bigemina</i>	<i>Anaplasma marginale</i>	Mixed infection
2013	21	7 (33.33%)	7 (33.33%)	-	-	-
2014	24	1 (4.17%)	-	-	1 (4.17%)	-
2015	21	2 (9.52%)	-	1 (4.76%)	1 (4.76%)	-
2016	73	15 (20.55%)	7 (9.59%)	1 (1.37%)	3 (4.11%)	4 (5.48%)
2017	156	31 (19.87%)	10 (6.41%)	5 (3.21%)	12 (7.69%)	4 (2.56%)
2018	81	7 (8.64%)	2 (2.47%)	4 (4.94%)	-	1 (1.23%)

Table 2. Seasonal prevalence of haemoprotozoan parasites of cattle

Season	Total	Positive cases				
		Total	<i>Theileria annulata</i>	<i>Babesia bigemina</i>	<i>Anaplasma marginale</i>	Mixed infection
Summer	77	16	8 (10.39%)	4 (5.19%)	3 (3.90%)	1 (1.30%)
Winter	75	8	7 (9.33%)	-	1 (1.33%)	-
Sou West	136	23	5 (3.68%)	4 (2.94%)	9 (6.62%)	5 (3.68%)
Nor East	88	16	6 (6.82%)	3 (3.41%)	4 (4.55%)	3 (3.41%)
Total	376	63	26 (6.91%)	11 (2.93%)	17 (4.52%)	9 (2.39%)

**Fig. 1. Piroplasm of *Theileria annulata*****Fig. 2. Inclusion bodies of *Anaplasma marginale*****Fig. 3. Piroplasm of *Babesia bigemina*****Fig. 4. Seasonal prevalence of haemoprotozoan parasites**

DISCUSSION

The overall prevalence of haemoprotozoan diseases in this investigation was consistent with the earlier report of Alim *et al.* (2012), who recorded 16.18 percent in crossbred cattle.

Further, the observations on the high prevalence of theileriosis in this study were on par with the findings of Bhatnagar *et al.* (2015), Rohaya *et al.* (2017) and Shashi Kala and Bhawesh Gopal Deo (2018), who reported higher prevalence of bovine theileriosis followed by anaplasmosis and babesiosis in

cattle. In line with our findings, El-Matenawy (2000) and Abdullah *et al.* (2019) also reported that *Theileria annulata* was the most prevalent haemoparasite affecting cattle in Saudi.

In India, theileriosis is a fatal parasitic disease and has been reported from various geographical regions of the country and recorded as 21.1% in Tamil Nadu (Anandan *et al.*, 1989). On contrary, Maharana *et al.* (2016) reported highest prevalence of babesiosis followed by theileriosis, anaplasmosis and trypanosomiasis.

The lower prevalence of babesiosis (2.93%) recorded in this study was comparable with Babale *et al.* (2020), who recorded 3.33% prevalence in cattle of Madagali local Government area of Adamawa state, Nigeria. The reason could be due to lower occurrence of vector *Rhipicephalus microplus* compared to *Hyalomma* spp., as opined by Velusamy *et al.* (2014).

The presence of mixed infections (2.39%) in the present study coincided with the previous finding of Vahora *et al.* (2012), who recorded 2.73% mixed infections in crossbred cattle in Gujarat.

The impact of seasonal influence on the prevalence of haemoprotozoan diseases was also documented in the present study. The more abundance of *Theileria annulata* in summer months recorded in this study was in accordance with the report of Velusamy *et al.* (2014) in Namakkal area of Tamil Nadu, where a high prevalence of theileriosis was observed during summer (14.4%), followed by moderate in monsoon (13.8%) and less in fair seasons (11.5%). The high prevalence of theileriosis observed in the present study might be due to high temperature and humidity, which favours the tick vector population, as discussed by Haque *et al.* (2010) and Magona *et al.* (2011).

In contradiction to our findings, there are few reports (Roy *et al.*, 2004; Vahora *et al.*, 2012) of higher prevalence of theileriosis during monsoon season. Ganguly *et al.* (2017) also reported a significantly higher prevalence of *T. annulata* in rainy (37.26%) and summer (32.49%) and less in winter (26.61%).

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While studying the prevalence of babesiosis, it was recorded that highest prevalence was during summer and south west monsoon followed by north east monsoon. The result was found to be somewhat similar to the reports of Lako *et al.* (2007) and Kamani *et al.* (2010). The overall prevalence of anaplasmosis was in agreement with the reports of Siddiki *et al.* (2010) and Muhanguzi *et al.* (2010).

The possible seasonal variation with regard to the prevalence of haemoprotozoan disease might be due to changes in macroclimate that is essential for breeding of ticks.

It is concluded that the outcome of the present study would help to forecast disease outbreak, treatment and control of the disease, not only in this region but also applicable to other parts of the country, thereby saving the farmer's livelihood.

Conflict of interest: Authors have no conflict of interest in this study.

Author's contribution: AM: Involved in data collection, analysis of the data and preparing the original draft; TA: Engaged in final editing; KS: Contributed in collecting the data and correcting the manuscript.

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