

Original Research Article

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## Epidemiological Aspects of Theileriosis in Cattle in and around Patna, Bihar, India

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### ABSTRACT

The present study was conducted for a period of one year from May 2015 to April 2016. A total of 937 blood samples of cattle were screened for theileriosis. Thin blood smears were prepared, air dried, fixed with methanol and stained with Giemsa stain. The microscopic examination of stained blood smears were performed and presence of intraerythrocytic piroplasms in different shapes like round, oval, signet ring, pear, comma, rod or bacilli indicating the incidence of theileriosis in cattle in and around Patna. The breed, age, sex, and seasons were considered some of the important epidemiological parameters. Out of 937 suspected cases, 291(31.05%) samples were found positive for theileriosis. The incidence was found significantly ( $<0.01$ ) higher in crossbred cattle 185(63.57%) than indigenous cattle 106(36.43%). Higher incidence was recorded in female (97.94%) than male (2.06%). This might be due to increased introduction of female in livestock population due to obvious reason of improved artificial insemination technology in herd and farmers are not interested in rearing and spending on male. The incidence was higher in animals above 2 years age group (92.78%) than 6 months to 2 years age group (7.22%). The season played an important role in incidence of theileriosis, the incidence was significantly ( $<0.01$ ) higher in rainy season (44.33%) followed by summer (34.71%) and winter season (20.96%). The finding of the study suggested that the bovine theileriosis is mostly prevalent in rainy season. Therefore management of the disease in that particular season is very important to save the life of the animal and special control measure may be adopted in rainy season.

#### Keywords

Theileriosis,  
Incidence, Blood  
smear, Season, Breed,  
Age, Sex, Cattle,  
Patna

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### Introduction

Theileriosis is a major constraint to livestock production and food securities in many developing countries. Bovine theileriosis is a haemoprotozoan disease caused by parasites of genus *Theileria* belonging to Family Theileridae, which are round ovoid rod like or irregular shaped organism found in

lymphocytes, histiocytes and erythrocytes (Soulsby, 1982). There are different species of *Theileria*, among which *Theileria annulata* and *Theileria parva* are considered as most pathogenic species causing lymphoproliferative diseases. A severe form of the disease called Bovine Tropical theileriosis is caused by *Theileria annulata* and transmitted by Ixodid ticks of *Hyalomma*

*spp.* These are usually two host ticks because the larva moult to nymph on the same host, nymph detaches and drops off on the ground to moult into an adult and seek a new host. The hot and humid climate acts as highly favourable criteria for the development and survival of tick vector and is a constant source of infection to susceptible animals (Singh *et al.*, 2017 and Kohli *et al.*, 2014). Ticks are voracious blood sucking obligate ectoparasites of cattle (Bishop *et al.*, 2004). Blood loss due to heavy tick infestation impoverishes hosts and cattle may remain weak and stunted. Almost 80% of the cattle are exposed to tick infestation worldwide (Anim *et al.*, 2013).

Usually tick preferred thin and short hair skin for infestation because mouth part can easily penetrate the vascular region for feeding (Sajid, 2007). Most of the animals suffered during monsoon month, which might be due to more number of ticks in monsoon which were developing during summer months (Ananda *et al.*, 2009). Previously the disease has been reported from different states by various workers in several years, Odisha (Singh *et al.*, 2017, Acharya *et al.*, 2017 and Acharya *et al.*, 2016), Punjab (Kumar *et al.*, 2015), Hariyana (Chaudhari *et al.*, 2013), Gujarat (Vahora *et al.*, 2012) and North Bangalore (Ananda *et al.*, 2009).

Dairy animals, especially bovines, which are bearing production stress along with other diseases, are potential viable host to the infections. Bovine theileriosis is a 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) and is of great

economic importance in Asia and has always been a formidable barrier to the survival of exotic and cross bred cattle in India. It causes significant morbidity and mortality in cattle and buffaloes. Devendra, (1995) reported the annual loss of US \$ 800 million due to tropical theileriosis in India.

Most common symptoms of bovine theileriosis are anorexia, pyrexia, conjunctival petechia, swollen lymph nodes, weight loss, weakness, coughing, nasal discharge, and diarrhoea. Tentative diagnosis in field is mainly based on clinical signs and tick infestation on the infected animals. However confirmatory diagnosis based on microscopic examination of Giemsa stained thin blood smears. Many animals die and undergo a long period of convalescence entailing loss of milk and meat production. The mortality rate can be reduced with early diagnosis and effective treatment.

The present investigation was carried out to record the incidence of theileriosis along with other epidemiological parameters of bovine theileriosis in and around Patna, Bihar

## **Materials and Methods**

### **Samples collection**

During the period from May 2015 to April 2016, a total of 937 blood samples of cattle were received at Parasitology Section, Institute of Animal Health and Production, Bihar, Patna with clinical manifestation of high rise of temperature, enlargement of lymph nodes, anaemia, anorexia, weakness, nasal discharge, reduced milk yield and history of tick infestation. Mostly the samples were referred by field veterinarians. The samples received were generally of female cattle of all ages. It includes both indigenous and crossbred animals. The blood samples were brought in vial containing EDTA.

### **Smear preparation**

Thin blood smears were prepared and were air dried, fixed with methanol, stained with Giemsa stain and examined under the oil immersion lens (100X) of microscope (Zafar *et al.*, 2006; Qayyum *et al.*, 2010). The parasites were identified according to the characters described by Soulsby (1982). Blood smears were examined carefully (Fig. 2) and even the presence of single piroplasm was considered positive for *Theileria spp.* A total 937 cases were screened and out of which 291(31.05%) cases were found positive for theileriosis.

### **Microscopic examination**

The diagnosis of *Theileria* infection is based on clinical findings and microscopic examination of Giemsa stained thin blood and lymph node smears in acute cases. Giemsa staining technique is frequently used for detection of parasite as it is comparatively inexpensive. However, expertise in microscopic detection of piroplasm is required in subclinical or chronic infection because parasitemia is often extremely low and may otherwise miss (Maharana *et al.*, 2016). Subclinical infection in cattle with *Theileria annulata* in endemic regions produces chronic carrier state and serves as source of infection for ticks.

### **Data analysis**

On the basis of blood smear examination, the positive cases of theileriosis were spreaded as breed, age, sex and season wise. To record age wise incidence, cases were distributed in three age groups viz., below 6 months, 6 months to 2 years and above 2 years. Further to study the seasonal incidence of the disease the data were analysed as per season viz., summer (March-June), rainy (July-November) and winter (December-February). An important feature of

the retreating monsoon season in Bihar is the invasion of tropical cyclones originating in the Bay of Bengal at about 12°N latitude. Bihar is also influenced by the typhoons originating in South China Sea. The maximum frequency of the tropical cyclones in Bihar is during September-November especially during the asterism called hathiya. Data obtained were compiled and tabulated for frequency and finally converted into percentage to draw inferences. Chi-square test was used to see significant differences ( $P < 0.01$ ) in parasitic infections among breed, age, sex and season (Maharana *et al.*, 2016).

### **Results and Discussion**

The analysis of data revealed that out of 937 blood samples, 291 (31.05%) samples were found positive for theileriosis.

#### **Breed wise incidence**

From Table 1 (Fig. 1b), it is evident the incidence of theileriosis was higher in cross breed (63.57%) than indigenous (36.43%). The value of  $\chi^2_1$  d.f (21.36) revealed highly significant ( $< 0.01$ ) difference in the incidence pattern of bovine theileriosis on the susceptibility of indigenous and crossbred cattle.

#### **Age wise incidence**

The data shows (Table 2) that the animals above 2 years of age were more susceptible (92.78%) than the animals of 6 months to 2 years of the age (7.22%). However the evidence of theileriosis was not found in calves below 6 months of age.

#### **Sex wise incidence**

From Table 2, it is evident that the incidence of the disease was higher in female (97.94%) than in male (2.06%).

### Season wise incidence

From Table 3 (Fig. 1a), the analysis of different seasons revealed significantly ( $<0.01$ ) higher incidence of theileriosis during rainy season 129(44.33%) and minimum during winter season 61(20.96%). The incidence of theileriosis during summer season was found 101(34.71%).

The present study is focussed on haemoprotozoan disease theileriosis, a major constraint to livestock production and its prevalence in and around Patna, Bihar. Theileriosis is a fatal parasitic tick-borne disease. Majority of cases were manifesting common clinical sign viz. anorexia, pyrexia, pale conjunctival mucous membrane, enlargement of prescapular and prefemoral lymph nodes, nasal discharge, coughing, grinding of teeth, diarrhoea, respiratory distress, lacrimation, corneal opacity and anaemia.

The study was carried for a year from May 2015 to April 2016 by using Giemsa staining technique (Fig. 2). Similar clinical sign in theileriosis affected animals were reported by many workers (Singh *et al.*, 2017; Soulsby, 1982; Singh *et al.*, 2001; Masare, *et al.*, 2009; Radostits *et al.*, 2010 and Khan *et al.*, 2011). The prevalence of theileriosis depend on geographical region and several other factors like density, climatic conditions, age, sex, management practices and immunity either passive or active (Magona *et al.*, 2011 and Gul *et al.*, 2015).

Breed wise incidence of theileriosis were significantly ( $<0.01$ ) higher in crossbred (63.57%) than indigenous cattle (36.43%). This might be due to higher susceptibility of crossbred animal to the disease. The results of the present investigation on breed wise susceptibility are in close agreement with the finding of Singh *et al.*, (2001), Rakha and

Sharma (2003), Qayuum *et al.*, (2010), Panda *et al.*, (2011), Kohli *et al.*, (2014), Velusamy *et al.*, (2014), Acharya *et al.*, (2016), who reported higher incidence of theileriosis in crossbred than the indigenous breed.

The present study is in accordance with Ananda *et al.*, (2009), who observed breed wise susceptibility in crossbred cattle of Bangalore North. However, Maharana *et al.*, (2016) reported breed wise higher infection rate in non-descript cattle (42.46%) than pure breed (29.62%). The prevalence is influenced by cattle breed as cattle usually differ in tick resistance and innate susceptibility to infection (Muhammad *et al.*, 2008 and Gul *et al.*, 2015).

Age wise investigation showed the higher incidence of theileriosis in animals above 2 years of age (92.78%) than the animals between 6 months to 2 years of age (7.22%). However the incidence of theileriosis was not observed in calves below 6 months of age, this might be due to passive immunity from mother. The present observations are in close agreement with Singh *et al.*, (2017), who recorded more incidence in older calves of 7-12 months of the age than younger calves and also reported that farmers prefers to give anti theilerial treatment to calves without going for blood examination because calves need a smaller dose due to less body weight and the drug acts as both preventive and curative purpose. These findings were in contrary to finding of previous worker Masare *et al.*, (2009) who reported higher incidence of theileriosis in calves below 2 months of age (73.33%) than older ones (above 2 month and up to 12 months age) presented to TVCSC, COVAS, Udgir, Maharashtra. However Maharana *et al.*, (2016) reported, the risk of overall prevalence of haemoprotozoan infection was significantly higher in older (more than 5 years) and lower in adult (1- 5 years) in comparison to young cattle (below 1 year).

**Table.1** Breed wise distribution of theileriosis in cattle in and around Patna

Breed	Frequency	Percentage	Calculated $\chi^2_1$ d.f
Indigenous	106	36.43	21.36**
Crossbred	185	63.57	
Total	291	100	

\*\*Significant at <0.01

**Table.2** Age and sex wise distribution of theileriosis in cattle in and around Patna

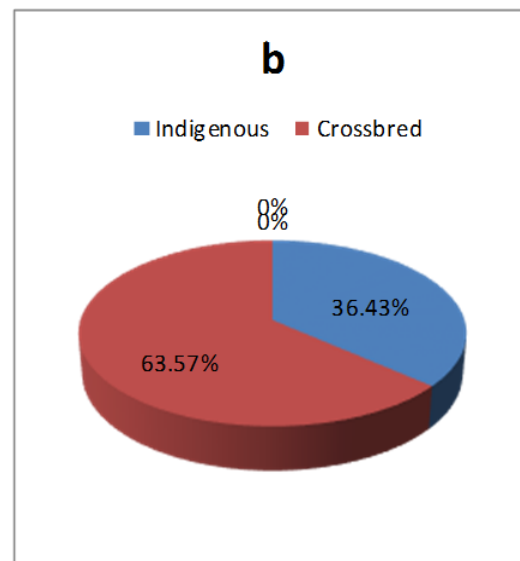
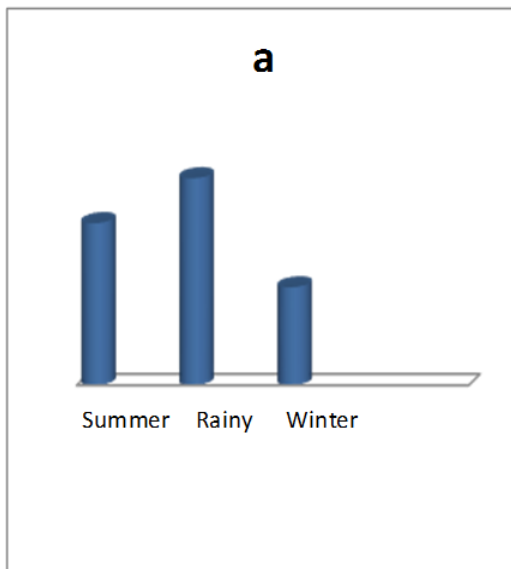
Age Group	Male	Female	Total
Below 6 months	0	0	0
6 months-2 years	4 (1.37%)	17 (5.84%)	21 (7.22%)
Above 2 years	2 (0.69%)	268 (92.10%)	270 (92.78%)
Total	6 (2.06%)	285 (97.94%)	291 (100%)

**Table.3** Season wise distribution of theileriosis in cattle in and around Patna

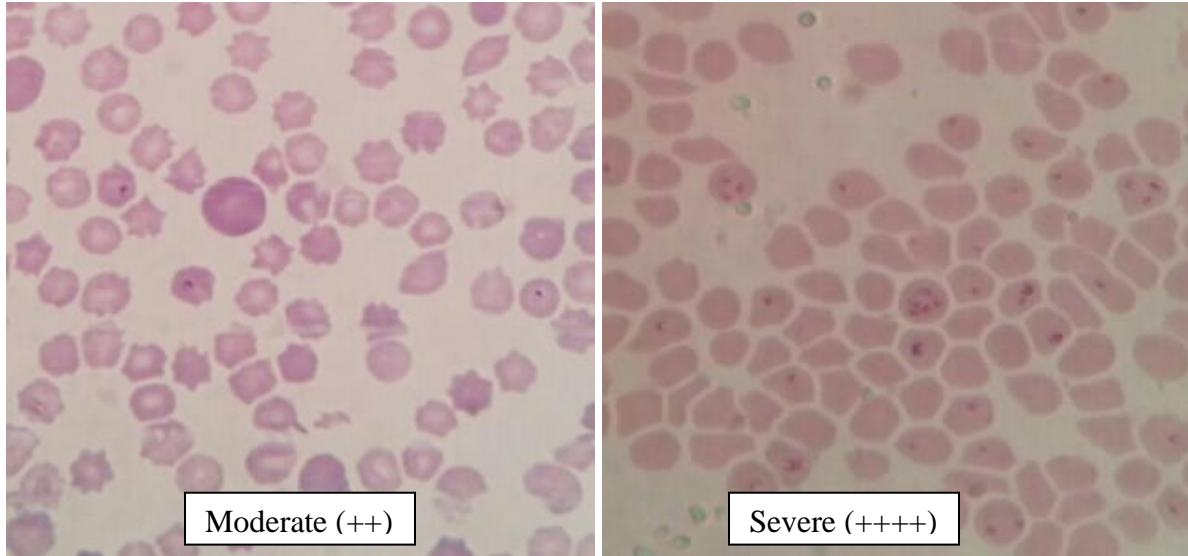
Season	Frequency	Percentage	Calculated $\chi^2_2$ d.f
Rainy	129	44.33	24.07**
Winter	61	20.96	
Summer	101	34.71	
Total	291	100	

\*\*Significant at <0.01

**Fig.1** (a) Season and (b) Breed wise incidence of theileriosis in cattle in and around Patna



**Fig.2** Giemsa stained blood smear showing piroplasm of *Theileria* parasites (100 X)



Inverse age resistance and stronger passively acquired immunity might be due to the contributing factors behind the lower incidence of haemoprotozoan parasites in younger age group of animals (Maharana *et al.*, (2016). While, Khan *et al.*, (2017) reported higher prevalence in cattle above 5 years (29.90%) followed by calves below 1 year (27.15%) and in cattle 1-5 years of age (23.06%).

Sex wise incidence was recorded higher in female (97.94%) than male (2.06%). This might be due to less market value of male crossbred animal and also farmers are interested in raising female calves as replacement stock. Due to introduction of artificial insemination technology in livestock production, the owners are not interested for rearing and spending on male calves. As a result of which more number of blood samples from female cattle were presented for diagnosis. Similar observations were also recorded by Panda *et al.*, (2011) and Khan *et al.*, (2017), who reported higher prevalence of theileriosis in females than males. However, Maharana *et al.*, (2016) reported higher incidence of haemoprotozoan parasite

infection in female cattle than male but did not differ significantly owing to common managerial practices being adopted for both the sexes and also reported higher prevalence in female might be due to hormonal disturbances which penetrate it to weakened immune system.

Seasonal investigation on bovine theileriosis revealed that the season played a significant (<0.01) role on the incidence of bovine theileriosis. The highest incidence of the disease was observed in rainy season (44.33%) followed by summer season (34.71%) and winter season (20.96%), this might be due to abundance of tick during rainy season which were developed during summer months. The observation are in agreement with Kohli *et al.*, (2014), who reported that theileriosis is most prevalent in rainy season and minimum in winter season. Our results are also in close agreement with a study, in which Vahora *et al.*, (2012) and Bhatnagar *et al.*, (2015) recorded higher incidence of theileriosis during monsoon. However Velusamy *et al.*, (2014) recorded significantly high prevalence of theileriosis during summer followed by moderate in

monsoon and less in fair seasons. These differences are might be due to climatic changes, because high temperature and humidity is ideal for survival and breeding of ticks. Similarly, Chaudhri *et al.*, (2013) recorded higher infection in summer and rainy season (9.2% and 1.1%) than in winter, correlated to the high activity of their tick vectors during summer and rainy seasons.

The increased incidence in rainy season was indicative of seasonal occurrence of the disease due to the presence of vectors. The highest abundance of tick was reported in the month of July (Sajid *et al.*, 2007), whereas *Hyalomma spp.* of tick is most abundant in June (Durrani *et al.*, 2008). By using Giemsa staining method, Khan *et al.*, (2017) reported over all 14.32% prevalence of theileriosis in cattle from the period of March to May.

On the basis of blood smear examination it was concluded, the incidence of bovine theileriosis was significantly higher in rainy season especially in crossbred cattle might be due to abundance of vectors developing during summer season. Therefore, in order to reduce the incidence of theileriosis there is a need for further investigation by using molecular diagnostic technique like PCR for the diagnosis of carriers of the theileriosis and appropriate tick eradication programmes may be adopted.

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