

PREVALENCE OF HAEMONCHOSIS OF GOATS AT RAJSHAHI DISTRICT IN BANGLADESH

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ABSTRACT

A study was conducted in the Laboratory of Animal Husbandry and Veterinary Science, University of Rajshahi, Rajshahi, Bangladesh, during March, 2011 to February, 2012. The aim of this study was to determine the effects of temperature, humidity and rainfall in different months on the prevalence of haemonchosis of goats in Rajshahi, Bangladesh. A total of 720 samples were examined, of these (416) 57.8% goats were found positive for *Haemonchus* spp. infection. The highest prevalence was observed in the month of July (82.1 %) followed by August (79.7 %) and lowest in the January (28.3 %) followed by February (38.7 %). It was also observed that temperature (29.8°C), relative humidity (86%) and rainfall (146.0 mm) in the month of July was favourable for the egg laying, hatching and survival of infective larvae on the pasture. On the other hand, all the factors like temperature, humidity and rainfall was recorded lowest as 17.5°C, 79%, 5.5 mm respectively which was unfavourable for the reproduction and survival of infective larvae in the month of the January. The current study revealed that haemonchosis is an important and common parasitic disease and requires special attention for its control. The prevalence among different months when compared statistically (Chi-square test and DMRT) revealed significant (P=0.001) differences. So, it is concluded that, month of the year, temperature, humidity and rainfall has significance effect on the prevalence of haemonchosis in goats. Considering those factors control should be carried out in and around Bangladesh to improve our goat production.

Key word: Haemonchosis, Goats, Month, Bangladesh

INTRODUCTION

Livestock sector comprises an integral component of the country's crucial and largely subsistence economy. The population size of livestock in Bangladesh are estimated to be 23.43 million cattle, 1.45 million buffalo, 25.61 million goats, and 3.15 million sheep up to February, 2014 (BER, Bangla, 2014). The total livestock population is about 536.60 (lacs) contributing 37.38 (lac ton) milk and 30.21 (lac ton) meat (BER, Bangla, 2014). Goat is a very important ruminant species in Bangladesh. They are highly prolific, have short generation interval and the products are easily marketable. Goats make a significant contribution to the maintenance of household stability, improved household nutrition, alleviation of hunger, better livelihoods, more effective utilization of unpaid family labour and increased self-reliance. Goats are multipurpose animals, which provide meat, milk, hair, wool and skin. Among the problems encountered, parasitism is thought to be the major causes of hindering the goat production (Dewan *et al.*, 1979; Nooruddin *et al.*, 1987; Shahiduzzaman *et al.*, 1999). Parasitic infestations are the major veterinary problems in most of the developed & under developed countries of the world that is responsible for deterioration of the health and productivity of livestock. Haemonchosis is a parasitic disease caused by nematode of *Haemonchus* (*H.*) *spp.* The blood sucking parasite *H. contortus* which is found in the abomasum of the sheep and goat causes significant blood loss; each worm removes 0.05 ml blood per day so that sheep with a 500 *H. contortus* may loss about 250 ml per day (Urquhart *et al.*, 1988). *H. contortus* is a predominant, highly pathogenic and economically important disease of sheep and goats (Maqsood *et al.*, 1996; Mortensen *et al.*, 2003).

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Bangladesh has a tropical monsoon climate characterized by wide seasonal variations in rainfall, high temperatures, and humidity. Regional climatic differences in this flat country are minor. Three seasons are generally recognized: a hot, muggy summer from March to June; a hot, humid and rainy monsoon season from June to November; and a cold, dry winter from December to February. In general, maximum summer temperatures range between 38 and 41°C (100.4 and 105.8°F). April is the hottest month in most parts of the country. January is the coolest month, when the average temperature for most of the country is 16-20°C (61-68°F) during the day and around 10°C (50°F) at night. Heavy rainfall is characteristic of Bangladesh causing it to flood every year. With the exception of the relatively dry western region of Rajshahi, where the annual rainfall is about 1,600 mm (63.0 in.), most parts of the country receive at least 2,300 mm (90.6 in) of rainfall per year. Bangladesh forms the largest delta in the world and is situated between 88°10' and 92°41' East longitudes and between 20°34' and 26°38' North longitudes. The Rajshahi division is relatively high and cannot hold waters during monsoon (Wikipedia, 2014).

The prevalence of parasitic infestation depends on ecology, geographical and agro-climatic condition prevailing in Bangladesh (Hossain *et al.*, 2004). The geo-climatic conditions of Bangladesh are highly favorable for the growth and multiplication of parasites. The optimal condition for development from egg to L3 is 28 °C with humidity greater than 70% (Rossanigo & Gruner, 1995), and little or no development of eggs to larvae will take place below 9 °C (Silverman & Campbell, 1959). On this basis, the environmental conditions in which external larval stages of *H. contortus* can develop and complete their life cycle are limited in cold temperate climates. *H. contortus* is most prevalent in tropical and subtropical, warm, moist regions of the world (Dorny *et al.*, 1996). Prevalence haemonchosis of goats was frequently observed by other researcher in Mymensingh, Bangladesh (Qadir, 1967, Shahiduzzaman *et al.*, 2003). But there is no report on northern area especially in Rajshahi. Keeping in view, the importance of haemonchosis, the present research was undertaken to determine the effects of mean temperature, relative humidity and total rainfall on monthly occurrence of *H. spp.* infection in Rajshahi, Bangladesh.

MATERIALS AND METHODS

Study design

The present study was designed to assess the month-wise prevalence of haemonchosis of goats in the district of Rajshahi, Bangladesh and was conducted at Laboratory of Animal Husbandry and Veterinary Science, University of Rajshahi during the period starting from March 2011 to February 2012. In this cross-sectional study, a total 720 goats were selected from the villages, farms, pastures, veterinary hospitals and abattoirs by using simple random sampling method and examined for *Haemonchus* spp. infection.

Examination of sample

Faecal samples were collected by a two-finger procedure from the rectum of goats and were collected in 4% formalin in suitable airtight containers, such as screw-cap bottles and plastic bags with unique labels. At necropsy, abomasa were collected after slaughtering and evisceration of the goat in nearby slaughterhouses in the study area. For every sample, the information on month of collection was recorded using a questionnaire. The faecal samples and abomasa were brought into the Laboratory of Animal Husbandry and Veterinary Science, Faculty of Agriculture, University of Rajshahi for the presence of eggs and identification of *Haemonchus* spp. respectively.

Parasitological technique

Faecal samples were examined by direct smear and floatation techniques for the presence of *Haemonchus* spp. eggs (Martin *et al.*, 1990, Samad 2008). Eggs of *Haemonchus* spp. were identified on the basis of morphology (Soulsby, 1982; Urquhart, 2000). Each abomasum was opened along with the lesser curvature placing on the tray and the contents were placed in a jar containing water. The mucosa was cleaned under running tap water and the washings drained into the bucket, and clean water was added to it to make the desired volume. After thorough stirring, an aliquot of 1:20 was removed from the washings of the abomasum, into a container containing normal saline. The contents and washings of abomasa, were inspected for the presence of mature and immature worms and *Haemonchus* spp. was identified based on the characteristics reported by Soulsby, (1982) and Zajac *et al.* (2006).

Meteorological data

Meteorological data including temperature (maximum/minimum), relative humidity, total rainfall were obtained from Meteorological station, Shampur, Rajshahi (Table 1).

Table 1. Month-wise maximum, minimum and mean temperature, relative humidity and total rainfall of the study area

Month of collection of sample during study period	Maximum Temperature (°C)	Minimum Temperature (°C)	Mean temperature (°C)	Average relative humidity (%)	Total Rainfall (mm)
March-2011	33.1	19.1	26.1	65	11.0
April-2011	34.1	25.2	27.3	72	93.4
May-2011	33.9	26.7	28.9	82	187.4
June-2011	33.5	26.4	29.4	85	341.1
July-2011	32.9	26.7	29.8	86	146.0
August-2011	31.5	26.3	28.9	88	454.8
September-2011	32.5	23.5	29.3	87	202.7
October-2011	32.3	17.6	27.9	83	34.1
November-2011	28.6	17.6	23.1	81	1.0
December-2011	23.7	13.0	18.5	84	Nil
January-2012	22.8	11.7	17.5	79	5.5
February-2012	27.8	12.5	20.1	66	0.6
Overall	30.6	20.6	25.6	79.8	148.1

Statistical analysis

All the data that were collected entered to MS Excel sheet and analyzed by SPSS version 19. The monthly value was compared using by Duncan Multiple Range Test (DMRT) made by Steel and Torrie (1980). Descriptive statistics was also used to determine the prevalence of haemonchosis and Chi-square test (χ^2) was used to look the significant difference between months of the year with haemonchosis of goats. The confidence level was held at 95% and $P < 0.05$ were set for significance.

RESULTS AND DISCUSSION

The overall prevalence of haemonchosis was 57.8%, among them 50% was found positive for identification of eggs of *Haemonchus* spp. and 65.5% for the identification of adult and immature worms of *H. spp.* (Table 2). The prevalence of haemonchosis of goats were studied for the evaluation of meteorological factors (temperature, relative humidity and total rainfall) responsible for the occurrence of this disease in the study area. The month-wise prevalence of haemonchosis in goats in relation to meteorological data are presented in Table 4 & Fig. 1. The haemonchosis was highest in the month of July (82.1 %) and lowest in January (28.3%). The average maximum temperature reached 33.9°C in May, 2011 and minimum 11.7° C in January, 2012. The relative humidity was highest (88%) in the month of August and lowest (65%) in the month of March (Table 1). In the month of June and September the prevalence were 61.9% and 71.9% respectively (Table 4 & figure 1). Shahiduzzaman *et al.* (2003) reported highest prevalence in the month of July (84.42%) followed by June (72.58%) and October (72.41%). Whereas, the lowest prevalence of haemonchosis was found 46.15% in the month of January. The prevalence of infection relates to the humidity during the study period, which also followed an increasing pattern from April to August (72% to 88%) and then gradually decreased from September to March (87% to 65%). The findings of the study are also in coherent with the findings of Enyenihi *et al.* (1975) who reported that optimal conditions (hot and humid climate) are really helpful in the development of parasites. This variations in the findings with the earlier report might be due to the differences in sample size, species variation and also in the difference in the climatic condition of the study area.

Table 2. The prevalence of haemonchosis in goats

Type of examination procedure	Type of goat examined	Type of sample examined	No of sample Examined (n=)	No of <i>Haemonchus</i> infected sample (n=)	% of haemonchosis
Coproscopy	Live	Faeces	363	182	50.1
Necropsy	Slaughtered	Abomasum	357	234	65.5
Total			720	416	57.8

The hatching of eggs and survival of the infective stage of larvae depends on two most important components of the external environment, which is the temperature and relative humidity. The optimum temperature for the development of maximum number of larvae is the range of 18°C-26°C and humidity is high 100% although some development can occur down to 80% however, even in dry weather where the ambient humidity is low, the microclimate in faeces or at the soil surface may be sufficiently humid to permit continual larval development (Taylor *et al.*, 2007). For these reasons, the prevalence was started to decline from November (55.0% to April (49.1%) then increased gradually from May (61.3%) to August (82.1%). The effect of climatic factors on worm burden revealed a significant positive correlation with rainfall and relative humidity, which favourably support the larvae survival and development. This finding is in consistent with Amenu, (2005) who reported that the higher prevalence and worm burden occur during months of rainy season.

Table 3. Month-wise prevalence of haemonchosis in goats

Month of study	Total no. of sample examined (n)	Total no. of Positive sample (n)	Prevalence (%)	Chi-square value	Significance level
March-2011	52	26	50.0		
April-2011	57	28	49.1		
May-2011	62	38	61.3		
June-2011	56	46	61.9		
July-2011	61	45	82.1		
August-2011	64	51	79.7	79.707	(.000) ***
September-2011	64	46	71.9		
October-2011	63	39	73.3		
November-2011	59	32	55.0		
December-2011	60	24	40.0		
January-2012	60	17	38.7		
February-2012	62	24	28.3		
Total	720	416	57.8		

n= Number of observation, ***Significant at 0.1% level (P<0.001)

It was observed that highest prevalence of haemonchosis was recorded during the month of July (82.1%) and the lowest (28.3%) prevalence was recorded during the month of January. This is in agreement with studies

conducted in different parts of the world (Maingi *et al.*, 1993; Vlasoff *et al.*, 2001; Waruiru *et al.*, 2001; Ngingi *et al.*, 2001; Katoch, 2000; Laha *et al.*, 2001; Khajuria and Kapoor, 2003; Shahadat *et al.*, 2003; Lateef *et al.*, 2005; Keyyu *et al.*, 2005). The prevalence of haemonchosis started to decrease steadily from November to January and increase steadily from January to March. Nwosu *et al.* (2007) reported that *Haemonchus* was the most common nematode recorded during their study. They also reported that *Haemonchus* eggs and adults were high in prevalence and seasonal fluctuation was common in the study area. They further reported the high prevalence during hot humid season. Hansen and Perry (1994) and Urquhart *et al.* (1996) reported significantly higher parasitic load in the wet season than the dry season.

Self-cure phenomenon is the important for the epidemiology of haemonchosis. In this phenomenon, expulsion of adult parasite from the host takes place simultaneously although not invariably, eliminate incoming larvae. This may be associated with changes in the pastures, when a large uptake of infective larvae is superimposed on an established worm burden in a sensitized animal. Predisposing factor for haemonchosis include overcrowding, lush pasture, hot and humid weather and a low plane of nutrition. Self cure phenomenon is induced by the acquisition of large number of infective larvae developed in the pasture after heavy rainfall (Soulsby, 1982, Urquhart *et al.*, 1996). It was observed that, during the study period when the rain starts from the month of May, in that month goats were grazed and fed more amount of infective larvae and then infection was occurred. In this context, the highest rate of haemonchosis in the month of July followed by August and June. Re-establishment of infection after self-cure phenomenon is indicated by the gradual increase of prevalence of haemonchosis. This self-cure phenomenon may also be true for haemonchosis of goats in Rajshahi, Bangladesh where the rain starts from the May and creates the conducive environment for the development for the large number of infective larvae in the June and July on the rapidly growing pasture and the goats are easily infected with enormous amount of infective larvae. This is in line with the ageement of Shahiduzzaman *et al.* (2003) in Mymensingh, Bangladesh.

Table 4. Month-wise prevalence of haemonchosis in relation to mean temperature, relative humidity and total rainfall of study period

Month of Collection of sample during study period	Mean temperature (°C)	Relative humidity (%)	Total Rainfall (mm)	Percent of Infection (%)
March-2011	26.1	65	11.0	50.0 ^{de}
April-2011	27.3	72	93.4	49.1 ^e
May-2011	28.9	82	187.4	61.3 ^{cd}
June-2011	29.4	85	341.1	61.9 ^{bcd}
July-2011	29.8	86	146.0	82.1 ^a
August-2011	28.9	88	454.8	79.7 ^{ab}
September-2011	29.3	87	202.7	71.9 ^{abc}
October-2011	27.9	83	34.1	73.3 ^{abc}
November-2011	23.1	81	1.0	55.0 ^{cde}
December-2011	18.5	84	Nil	40.0 ^{ef}
January-2012	17.5	79	5.5	28.3 ^f
February-2012	20.1	66	0.6	38.7 ^{ef}
Overall	25.6	79.8	148.1	57.8

Nil=absent, abcdef with different superscript letter in the same column differ significantly with each other (P<0.001) by DMRT.

In the month of January, the lowest prevalence indicates to the less survival of eggs and pre-infective larvae (L₁, L₂) on pasture due to minimum temperature (11.7 °C) less moisture (relative humidity, 79%) and dry condition. Shahiduzzaman *et al.* (2003) also reported that the lowest percentages of infection in the winter months indicates the less survival of eggs and pre-infective larvae and subsequent development of infective L₃ in the pasture as less moisture and dry condition of the pasture as a result goats did not get more infective stages. In the winter months, arrested or inhibited (L₄) larval development of *H. spp.* occurs due to the adverse environmental conditions, which is known as hypobiosis. In this period, infective larvae did not develop due to low temperature (17.5°C), humidity (79%) and rainfall (5.5 mm). Arrested larval development plays important

role in the prevalence of the *H. contortus* infection in Rajshahi, Bangladesh. Shahiduzzaman *et al.* (2003) also stated that hypobiotic phenomenon of larval development of *Haemonchus* spp. in the host body because of adverse environmental condition influences in the winter as it happens in the temperate countries may also play an important role in Bangladesh. The prevalence of infection started to decline from November to January and then increased gradually from February to May this is similar to the findings of previous report of Al-Dulaimi *et al.* (1985). The mean monthly maximum temperature of 18°C or above and total monthly rainfall of 50 mm are conducive for translation and transmission of *H. contortus* (Gordon, 1953; Waller and Chandrawathani, 2005). The overall mean temperature, mean relative humidity and mean rainfall observed in this study were 25.6°C, 79.8% and 148.1 mm respectively which was favourable for the development of *Haemonchus* larvae and for that haemonchosis was prevalent throughout the year. The findings of this study may help to determine the time of routine deworming in goats against haemonchosis.

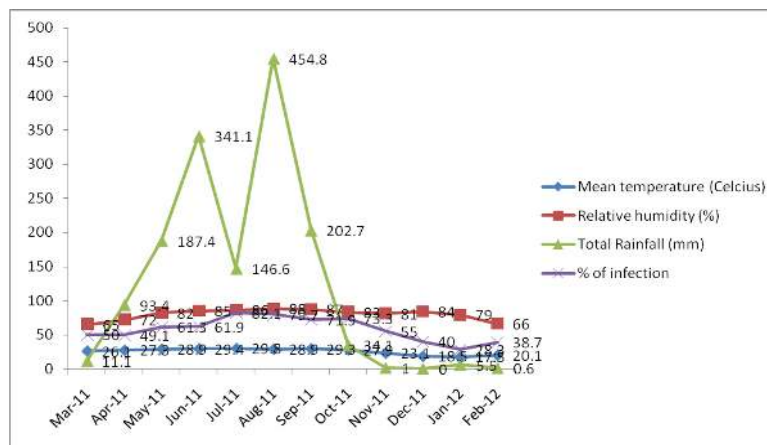


Fig. 1. Graphical representation of the month-wise prevalence of haemonchosis in relation to mean temperature, relative humidity and total rainfall of study period.

In the current study, the highest percentage of haemonchosis was recorded during the month of June followed by August which might be due to the optimum conditions (hot and humid climate) leading to the development and marked increase in the infective stage (L3) in the pasture. In the context of above discussion, it is concluded that goats should be regularly dewormed at the start rainy season and at least once again in December to control such a highly endemic parasitic disease.

ACKNOWLEDGEMENTS

Authors are thankful to the teachers and staff of the Department of Animal Husbandry and Veterinary Science, Faculty of Agriculture, University of Rajshahi, Bangladesh for their kind cooperation for completing her research. The authors would like to thank to the farmers, butcher's, staff of the veterinary hospital and farms of different Upazilla for providing samples and other facilities. The author also expresses her thanks to the Director of the Meteorological Station, Shampur, Rajshahi for providing meteorological data. The author is highly grateful to the Ministry of Science and Technology for giving financial support.

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