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IMPACT OF CLIMATIC VARIABLES ON THE EPIDEMIOLOGY OF STRONGYLOSIS IN GOATS OF KERALA

Syamala K.*, Devada K. , Bindu L., Raji K., Thirupathy V.R. and Lucy Sabu

Department of Veterinary Parasitology,
College of Veterinary and Animal Sciences, Mannuthy 680651. India
**Corresponding author: syamala@kvasu.ac.in*

ABSTRACT

Faecal sample from 654 adult goats were evaluated to assess the effect of climate on the epidemiolocal profile of gastro-intestinal strongyles in goats of Kerala. The climatic observations revealed the existance of a suitable period for translation of exogenous stages of major strongyles like *Haemonchus contortus, Trichostrongylus sp., Oesophagostomum sp.* and *Bunostomum sp*. from end of May to middle of September and again from early October to middle of November. The influence of season and month on the strongylosis in goats was found to be highly significant as remarkably higher incidence of strongyle infection in goats was detected during monsoon compared to pre- monsoon and post- monsoon. Thus, there are wide scope to reduce drench frequency, unnecessary expense on worm management and conserve the anthelmintic efficacy among our livestock.

Keywords: Climate, Epidemiology, Strongylosis, Kerala, Goat.

INTRODUCTION

Goats are rightfully recognised as the future livestock of choice owing to its adaptability potential, feed efficiency and product quality. Goat production has an imperative role in providing the nutritional and livelihood security of many marginal and resource poor farmers in India, a country that stands second in the world in goat population with 135.17 million goats. Gastro – intestinal parasitism is one of the major threats of pastoral ruminants because environment, which favour pastoralism, also favour the survival and development of exogenous stages of parasites. Periodical anthelmintic treatment, which has been recommended for years is now taken up by farmers presuming an increased efficiency and increased production response. Due to the development of anthelmintic resistance in the most economically important parasite of small ruminants world- wide, usage of alternate methods for management of parasites with limited chemotherapy is the need of the hour.

Knowledge on the epidemiological pattern of a particular disease in an area could provide information necessary for the effective management of a disease in the area. Swarnkar *et al.*(2008) observed that the environmental conditions like humidity,temperature rainfall and management practices in the areawere the major determinants of the epidemiology of gastro intestinal parasitism among small ruminants. Swarankar and Singh (2014) also opined that in Indian scenario the effective control of the most economically important parasites had been caught up by the failure to exploit the epidemiological profile of the parasite. Hence the present work was carried out to study the effect of climatic factors like temperature, rainfall and relative humidity on the type of parasite species prevalent in goats for a period of one year comprising of three seasons.

MATERIALS AND METHODS

A total of 50 adult goats were randomly selected from goat farms located in Malayoram (Mannuthy) and Central mid land (Pullazhy and Poomala)agro-ecological zones in Thrissur and were screened for a period of one year for parasitic load.The fresh faecal sample from rectum of the adult goats were collected and the intensity of strongyle infection was assessed by faecal egg count using modified McMaster technique (Coles *et al.*1992). Coproculture was carried out on pooled faecal sample every month by modified Veglia's method on the day of collection.

The infective larvae (L_3) were collected from the condensation droplets adhering to the sides of the culture bottles after adding one or two drops of water. The morphological identification of $L_3$of strongyles was done based on the keys provided by van Wyk *et al*.(2004) and van Wyk and Mayhew (2013). A total of 100 infectiveL_3in each sample were counted and differentiated into various species and result expressed as percentage of each species. The monthly climatic data during the study period (December 2017 to January, 2019) with regard to temperatue, relative humidity and rainfall were obtained from the nearest observatory at the Department of Agricultural Meteorology, College of Horticulture , Vellanikkara, Thrissur

RESULTS AND DISCUSSION

The mean weather parameters such as minimum and maximum temperature, rainfall and relative humidity at Mannuthy, Thrissur are presented in Table 1. The mean monthly minimum and maximum temperature ranged from 20.4°C (January) to 24.8°C (April) and from 29.2ºC (August) to 36.7°C (March), respectively. Monthly total rainfall ranged from 5.2 mm (February) to 928 mm

(August) and no rainfall occurred during December and January. The mean monthly relative humidity ranged from 47 per cent (February) to 89 per cent (June). Based on the above observations, the calender year was classified into pre-monsoon (February to May), monsoon (June to October) and post-monsoon (November to January).

Highly significant influence of season ($p<0.01$) was noticed in the prevalence of strongyle infection. A remarkably higher incidence of strongyle infection was detected during monsoon compared to pre-monsoon and post-monsoon as the highest mean Log Transformed Faecal Egg Count (LFEC) was noticed during monsoon.

The month wise prevalence of GI nematodes in goats was studied in Thrissur district. The FEC ranged from 0 to 8533 with a mean ± SE of (428.627 ± 42.5010). Monthly assessment of FEC indicated that during November to April, out of the 384 faecal samples evaluated 266 samples (69. 3 per cent) had FEC as zero while 358 animals (93.2 per cent) had FEC that ranged from 0 to 500. And only 24 samples (6.7 per cent) had FEC more than 500. An increase in the proportion of animals having moderate and high level of strongyle infection from the end of May to September was observed which gradually declined after October (Fig.1).The FEC was found to be highest during monsoon. It was also noticed that there was an ideal period of translation of the exogenous stages of *H. contortus*, *Bunostomum* sp. *Trichostongylus*sp. and *Oesophagostomum*

Table 1. Mean weather parameters in Thrissur during 2018-2019

Months	Mean weather parameters			
	Max temp (°C)	Min temp (°C)	Mean relative humidity (%)	Mean rain fall (mm)
January-18	33.5	20.9	53	0
February-18	35.7	23.2	47	5.2
March-18	36.7	24	59	33.2
April-18	36.1	24.8	69	28.9
May-18	33.2	22.6	79	483.6
June-18	29.8	22.2	89	730
July-18	29.6	22.5	88	793.2
August-18	29.2	24.7	87	928
September-18	32.2	22.5	75	629
October-18	32.8	22.9	76	393
November-18	32.7	23.3	68	66.6
December-18	33	22.5	63	0
January-19	32.9	20.4	55	0

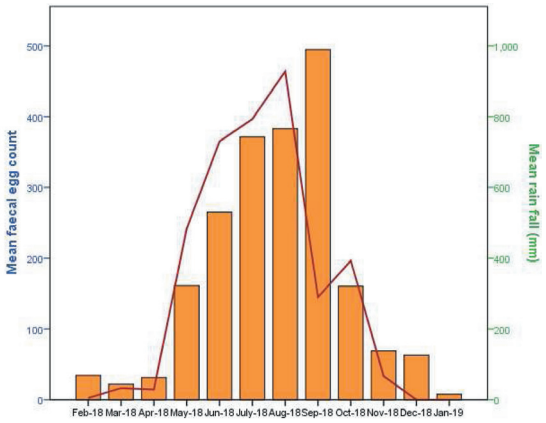

Fig 1.Relationship between monthly mean faecal egg count and rainfall.

sp. from the end of May to the middle of September and again from early October to mid -November.

Pooled faecal culture examination revealed that larvae of *H. contortus* was predominantly noticed throughout the year in Kerala, followed by those of *Oesophagostomum* sp., *Trichostrongylus* sp. and *Strongyloides*sp. Larvae of *Bunostomum* sp. was noticed only during the initial phase of the two monsoons in Kerala. The monthly larval composition study in Thrissur district revealed that the proportion of *H. contortus* was >70 per cent in all the months except May, June and October when *Bunostomum*sp. went up and *H. contortus*was drastically reduced. An increase in the proportion of *Trichostrongylus* sp. was noticed during November to January. Rise in proportion of *Strongyloides* sp. was also noticed during the monsoons.

Transmission of gastro intestinal strongylosis occurred only horizontally and directly and it was due to the interaction between the host, parasite and environment. In the present study, the seasonal influence of strongylosis in goats was found to be significant as FEC was significantly high ($p<0.01$) during monsoon compared to that in pre and post-monsoons. Similar observations were already reported by Swarnkar*et al.* (1997), Sharma *et al*. (2009), Agarwal *et al.* (2015), Bulbul *et al.* (2015), and Velusami*et al.* (2015). It could be attributed to the relative humidity, rainfall and temperature being favourable for development, survival and dispersal of strongyle larvae on the herbage as inferred by Bulbul *et al.* (2015).During rainy season, an increase in salinity of soil favouredecdysis (Soulsby, 1982), that invariably led to higher infection among the grazing animals.

During monsoon, occurrence and intensity of strongyle larvae in pasture land were high, which enhanced the transmission of strongylosis in small ruminants (Sheikh *et al.,* 2016). During summer, less herbage in the pasture land along with the exposure of the infective larvae to adverse climatic conditions contributed to low infectivity (Swarnkar*et al*., 2008). During monsoon, the climatic factors also favoured the multiplication of bacteria that provided optimum nutrition

to the free living stages of strongyle larvae (Singh *et al.,* 2018). A moderate temperature of 25 to 30° C, rainfall of >50 mm and relative humidity of 75 to 80 per cent were ideal for the development of the major strongyles (Rashid and Irshadullah, 2018). The high FEC detected in the present study immediately after summer just before monsoon, could be due to the development of hypobiotic larvae to adult worms which does not warrant deworming as suggested by Swarnkar and Singh (2014).

Monthly assessment of FEC in the organised farms and small holder flocks indicated that low proportion of animals harboured parasitic infection which were actually detrimental to their life and productivity and hence required treatment. On evaluation of the monthly prevalence of strongylosis high prevalence was noticed during the month of July, August and September. Thus deworming may preferably be done by mid of July and by the mid of October, if found necessary. To conclude, the treatment should be made to coincide with the environmental conditions that favoured the translation of eggs into larvae as reported by Swarnkar andSingh (2014) and Ahmed *et al.* (2015). Future investigations involving a minimum of three year of study throughout the different agroecological zones of Kerala would provide an accurate baseline data to initiate a bioclimatograph for the state.

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