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Prevalence of gastro-intestinal parasites in economically important Bonpala sheep in India

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Abstract: *Livestock are the important assets of landless and marginal farmers and help in improving the economy of agro-based countries like India. As the Bonpala sheep is highly prolific and having higher body weight in comparison to other two sheep breeds namely Garole and Sahabadi of West Bengal, so special emphasis should be given for scientific management and health care to the breed to increase the power of productivity and conserve the breed. Present study have been conducted to investigate the prevalence of gastro-intestinal parasites (GI) of Bonpala sheep in 'Teesta river' valley, West Bengal, India. Faecal samples and guts were collected during the month November' 10 to January' 14 from three block of Jalpaiguri district namely, Moynaguri, Dhupguri, Lataguri.The percentage of sheep infected with different gastro-intestinal parasites species including Haemonchus sp. (57.63%), Trichuris sp. (40.07%), Oesophagostomum sp. (21.48%), Trichostrongylus sp. (11.04%), Bunostomum sp. (6.74%), Fasciola spp. (9.48%), Paramphistomum sp. (24.96%), Moniezia sp. (13.85%), Stilesia sp. (2.07%) and Eimeria sp. (31.93%). Mixed infections have also been found during the survey. It has been found that the different aspect like seasonal variation, host age and sex affects the prevalence of gastro-intestinal parasitic infestation over the sheep breeds. A definite seasonal effect is observed, the monsoon (July-October) found to be season of severe infection of sheep, where the percentage of infection was obviously higher than other seasons. The study revealed that the prevalence of infection was higher in male in comparison to female. Young animals were more subjected to parasitic infection in comparison to older ones.*

Key words*: Parasitic infestations, gastro-intestinal, Bonpala sheep, Teesta river, India,*

I. Introduction

Among the livestock sheep rearing has gained an importance due to its short generation interval, higher prolificacy and the ease with which it can be reared, marketed and used as a resource to supplement the income of landless labours and small-marginal farmers. Tarai region of West Bengal especially the 'Teesta river' valley is proud of being the home tract of a sheep breed 'Bonpala sheep'. In these regions of West Bengal this sheep breed is mainly reared by poor and landless labours particularly the tribal population. Different gastro-intestinal parasites were reported from different geographical areas of India and other parts of world [1, 2, 3, 4, 5]. Gastro-intestinal parasitic infection has been considered as major constraint to ruminants productivity in terms of pathology and economic importance [6] on a clinical and subclinical level [7].

Based on faecal and post-mortem examination many researchers observed that younger ruminants were more infected in comparison to the older one [6, 8]. Courteny *et al.* [9] found that males were more infected with gastro-intestinal parasites in comparison to females. Male sheep were also more infected in comparison to the females [6]. Dhar *et al.* [10] studied the abomasum and intestinal tract of sixty two sheep of age group one to two years over a period of one year and observed various species of helminths. During the study of faecal sample examination of adult sheep aged two to four year showed rise in strongyle egg counts during the months of March and April of the year. The egg count reached their peak during the month of September (i.e. during rainy season).

Gastro-intestinal parasitic infestation were of common occurrence during monsoon and post monsoon season throughout India and their prevalence varied depending upon the prevailing environmental conditions of the place of study [11, 12, 13]. Agyei [14] in Ghana recorded the seasonal prevalence of GI parasites in sheep and reported *Haemonchus* sp., *Oesophagostomum* sp., *Trichostrongylus* sp. and *Cooperia* sp. as the prevalent nematode species. The prevalence of this gastro-intestinal parasites was higher during rainy season and very low or nil in the absence of rainfall. Beriajaya and Copeman [15] studied the gastro-intestinal nematodosis in sheep and goat in west Java. Their study also revealed that the egg-counts were significantly lower during the late dry and early wet season.

Yadav and Khajuria [16] examined faecal samples of small ruminants from Jammu district which revealed a total of 83.07% gastro-intestinal parasitic infection. Throughout the year seasonal variation was recorded. It was highest during rainy season followed by summer and winter .

In general, moist and warm environmental conditions are favourable for the development, survival and transmission of the pre-parasitic stages of GI parasites [17]. Rehman and Ali [18] observed the highest GI

parasitic infection in the months of June, July and August (i.e. during rainy season) in Pakistan. However, no study has been conducted in 'Teesta river' valley regarding the prevalence of different gastro-intestinal parasites in small ruminants specially Bonpala sheep. Keeping it in view the importance of gastro-intestinal parasites in small ruminants, the present study was conducted to investigate the age wise, sex wise and seasonal prevalence of gastro-intestinal parasites in sheep reared under traditional husbandry system in 'Teesta river' valley.

II. Material And Methods

The study was carried out during the year November' 10 to January' 14 covering three blocks namely Moynaguri, Dhupguri and Lataguri of Jalpaiguri district. A total of one thousand three hundred fifty sheep (both gut and faecal sample) were examined for the prevalence of gastro-intestinal parasites.

Fresh guts were collected from local abattoirs and brought to the laboratory for identification of gastro-intestinal helminth parasites. Faecal samples were collected directly from the rectum and brought to the laboratory for identification of eggs/larvae of GI parasites. Examinations were done following standard protocol. Identification of gastro-intestinal nematode eggs have been made on the basis of morphological characteristics features.

III. RESULTS

3.1 Overall prevalence:

Out of the total of one thousand three hundred fifty sheep examined through faecal and gut samples examination, eight hundred seventy nine (65.11%), two hundred one (14.89%), three hundred fifty three (26.15%), four hundred thirty one (31.93%) were infected with gastro-intestinal nematode, cestode, trematode and protozoa respectively (Table. 1 and Fig. 1). The percentage of sheep infected with different gastro-intestinal parasites species includes *Haemonchus* sp. (57.63%), *Trichuris* sp. (40.07%), *Oesophagostomum* sp. (21.48%), *Trichostrongylus* sp. (11.04%), *Bunostomum* sp. (6.74%), *Fasciola* spp. (9.48%), *Paramphistomum* sp. (24.96%), *Moniezia* sp. (13.85%), *Stilesia* sp. (2.07%) and *Eimeria* sp. (31.93%) (Table. 2 and Fig. 2). Mixed infections have also been found during the survey.

Table. 1 Prevalence of nematode, cestode, trematode and protozoan parasites in Bonpala sheep:

No. of sheep Examined	Nematode parasite (%)	Cestode parasite (%)	Trematode parasite (%)	Protozoan parasite (%)
1350	879 (65.11)	201 (14.89)	353 (26.15)	431 (31.93)

Table. 2 Overall prevalence of GI parasites in Bonpala sheep:

Parasites	Number	Percentage
Haemonchus sp.	778	57.63
Trichuris sp.	541	40.07
Oesophagostomum sp.	290	21.48
Trichostrongylus sp.	149	11.04
Bunostomum sp.	91	6.74
Fasciola sp.	128	9.48
Paramphistomum sp.	337	24.96
Moniezia sp.	187	13.85
Stilesia sp.	28	2.07
Eimeria sp.	431	31.93

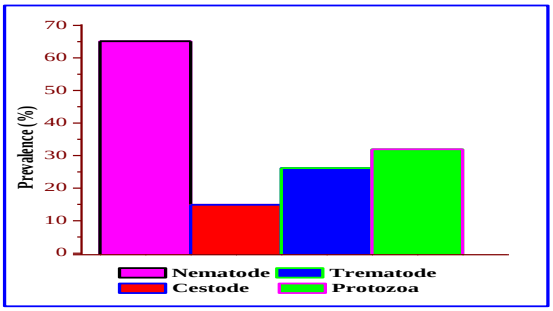

Figure 1: Overall Prevalence of nematode, cestode, trematode and protozoan parasite in Bonpala sheep.

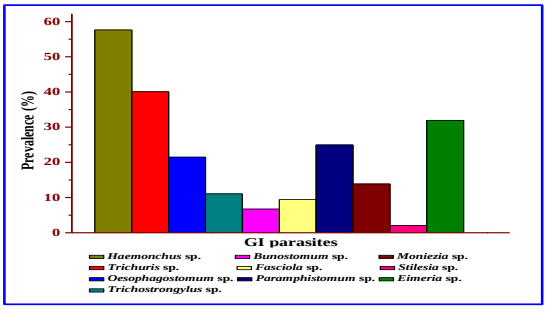

Figure 2: Overall prevalence of GI parasites in Bonpala sheep.

3.2 Age-wise prevalence:

After arranging all the data, age-wise epidemiological observation have been made which revealed highest prevalence rate of infection in lower age groups in Bonpala sheep (Table. 3 and Fig. 3,4). With the

increase in age, the infection level decreased. The highest prevalence rate of GI parasites recorded in younger age group while the lowest prevalence rate was in older age group. However, less than one year age group were more prone to infection. The results were significant (P<0.005) for all parasites i.e. nematode, trematode, cestode and protozoa and that too in regard to faecal examination.

Table. 3 Age-wise prevalence of GI parasites in Bonpala sheep:

Age Group	Gut Examination				Faecal Examination				
	No. Exam	Infected			No. Exam	Infected			
		N (%)	C (%)	T (%)		N (%)	C (%)	T (%)	P (%)
<1	101	71 (70.29)	19 (18.81)	34 (33.66)	230	193 (83.91)	53 (23.04)	84 (36.52)	185 (80.43)
1-2	116	66 (56.89)	18 (15.52)	30 (25.86)	241	188 (78.01)	37 (15.35)	65 (26.97)	157 (65.15)
2-3	124	63 (50.81)	13 (10.48)	27 (21.77)	235	151 (64.26)	28 (11.91)	58 (24.68)	52 (22.13)
>3	79	32 (40.51)	8 (10.13)	11 (13.92)	224	115 (51.34)	25 (11.16)	44 (19.64)	37 (16.52)
Total	420	232 (55.24)	58 (13.81)	102 (24.29)	930	647 (69.57)	143 (15.38)	251 (26.99)	431 (46.34)

N- Nematode; C- Cestode; T- Trematode; P- Protozoa

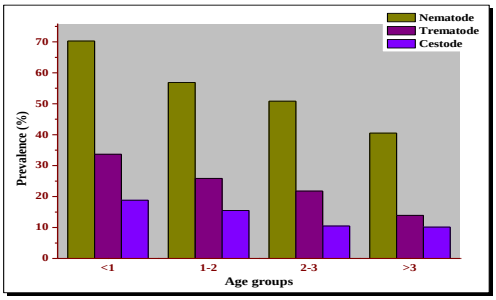

Figure 3: Overall age wise prevalence of GI parasites in Bonpala sheep through gut examination.

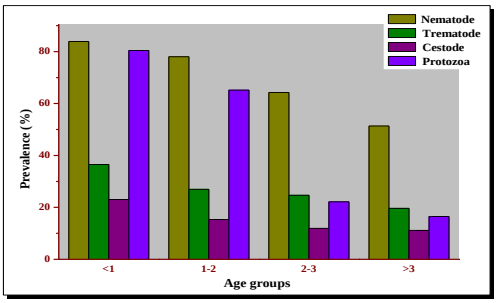

Figure 4: Overall age wise prevalence of GI parasites in Bonpala sheep through faecal examination.

3.3 Sex-wise prevalence:

The results of relationship between sex and gastro-intestinal parasites have been presented in Table 4. After pooling all the data, sex wise observations were made which revealed that males were more infected with gastro-intestinal parasites than females (Fig. 5,6). However, in males the prevalence of GI nematode infection was high; moreover for cestodes, trematodes and protozoa, the difference of sex was not much prominent. The influence of sex on the susceptibility of infection to animal could be attributed to genetic predisposition and differential susceptibility owing to hormonal control.

Table. 4 Sex-wise prevalence of GI parasites in Bonpala sheep:

Sex	Gut Examination				Faecal Examination				
	No. Exam	Infected			No. Exam	Infected			
		N (%)	C (%)	T (%)		N (%)	C (%)	T (%)	P (%)
Male	218	135 (61.93)	35 (16.06)	58 (26.61)	440	334 (75.91)	77 (17.50)	132 (30.00)	235 (53.41)
Female	202	97 (48.02)	23 (11.39)	44 (21.78)	490	313 (63.88)	66 (13.47)	119 (24.29)	196 (40.00)
Total	420	232 (55.24)	58 (13.81)	102 (24.29)	930	647 (69.57)	143 (15.38)	251 (26.99)	431 (46.34)

N- Nematode; C- Cestode; T- Trematode; P- Protozoa

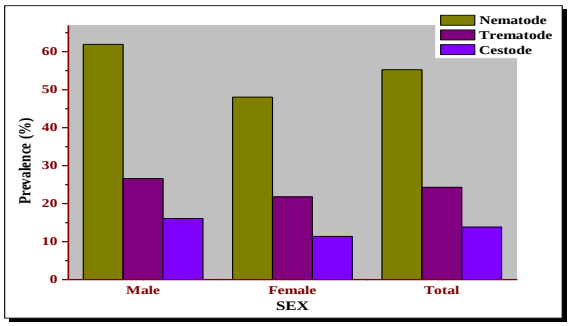

Figure 5: Overall sex wise prevalence of GI parasites in Bonpala sheep through gut examination.

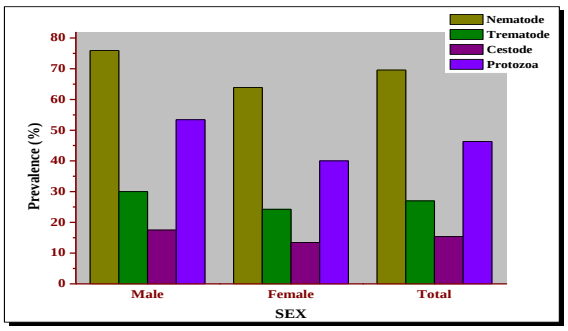

Figure 6: Overall sex wise prevalence of GI parasites in Bonpala sheep through faecal examination.

3.4 Seasonal prevalence:

Gut examination

Out of four hundred twenty sheep examined, two hundred thirty two (55.24%), fifty eight (13.81%) and one hundred two (24.29%) were positive for nematode, cestode and trematode infection respectively (Table. 5, Fig. 7). The highest nematode infection (63.06%) was reported in monsoon and lowest (48.20%) in summer ($P<0.05$). The highest cestode infection (18.47%) was observed in monsoon and lowest (10.07%) in summer (is not significant at the 0.05 level). For trematode parasites the highest infection (30.57%) was also in monsoon and lowest (18.71%) in summer ($P<0.05$).

Faecal examination

Out of nine hundred thirty sheep examined, six hundred forty seven (69.57%), one hundred forty three (15.38%), two hundred fifty one (26.99%), and four hundred thirty one (46.34%) were positive for nematode, cestode, trematode and protozoa respectively (Table. 5, Fig. 8). The highest nematode infection (81.87%) was reported in monsoon and lowest (58.01%) in summer ($P<0.05$). The highest cestode infection (22.05%) was observed in monsoon and lowest (9.94%) in also summer ($p<0.05$). For trematode the highest infection (35.35%) was in monsoon and lowest (20.19%) in summer ($P>0.05$). The highest protozoan infection (59.52%) was observed in monsoon and lowest (36.22%) in also summer ($P<0.05$).

Table. 5 Seasonal prevalence of GI parasites in Bonpala sheep:

Season	Gut Examination				Faecal Examination				
	No. Exam	Infected			No. Exam	Infected			
		N (%)	C (%)	T (%)		N (%)	C (%)	T (%)	P (%)
Monsoon	157	99 (63.06)	29 (18.47)	48 (30.57)	331	271 (81.87)	73 (22.05)	117 (35.35)	197 (59.52)
Winter	124	66 (53.23)	15 (12.09)	28 (22.58)	287	195 (67.94)	39 (13.59)	71 (24.74)	121 (42.16)
Summer	139	67 (48.20)	14 (10.07)	26 (18.71)	312	181 (58.01)	31 (9.94)	63 (20.19)	113 (36.22)
Total	420	232 (55.24)	58 (13.81)	102 (24.29)	930	647 (69.57)	143 (15.38)	251 (26.99)	431 (46.34)

N- Nematode; C- Cestode; T- Trematode; P- Protozoa

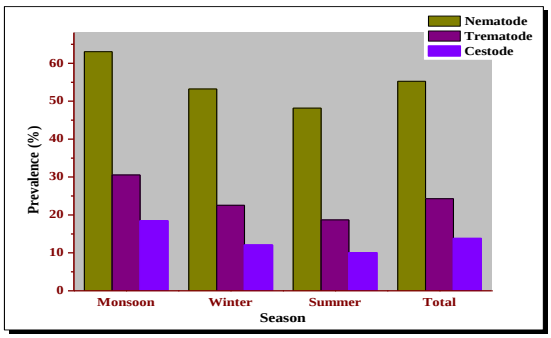

Figure 7: Overall seasonal prevalence of GI parasites in Bonpala sheep through gut examination.

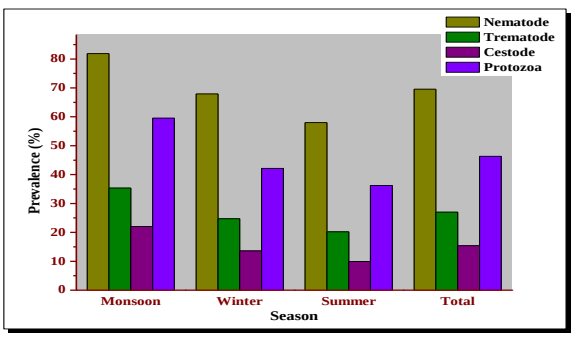

Figure 8: Overall seasonal prevalence of GI parasites in Bonpala sheep through faecal examination.

IV. Discussion

In the present study various species of GI parasites recovered which have been reported by many researchers in different climatic areas of India as well as others parts of the world [1, 3, 4]. Many factors like grazing habits, level of education and economic capacity of the farmers, standard of management and anthelmintic used may influence the prevalence of helminths. In the present study the prevalence of nematode parasites was highest (65.11%) which justified the findings of Pandit *et al.* [19]. However, the present study recorded the highest prevalence of *Haemonchus* (57.63%) and *Trichuris* (40.07%). Molla and Bandyopadhyay [20] recorded the highest prevalence of nematode, *Haemonchus* (61.11%) followed by *Oesophagostomum* (45.56%) in Bonpala sheep of 'Teesta river' valley. Nasreen *et al.* [21] also reported *H. contortus* most prevalent parasite among nematodes in sheep. Although, *H. contortus* is particularly adapted to warm climates of tropics and subtropics it was very much prevalent in sheep in the temperate climate of India.

In the present study it has been observed that the lower age group of animals are found to be infected more with gastro-intestinal parasites because of high susceptibility and low resistance in young animals. These findings are closely related to the findings of Pal and Qayyum [22], Maqsood *et al.* [23], Vlassoff *et al.* [24], Vanimisetti *et al.* [25] and Lateef *et al.* [26]. Thus age is an important factor in the onset of infection because immunity played a great significant role in the establishment of parasites in the host body. The findings of the present investigation have indicated that age of the host seems to have influence on the prevalence of infection. The high infection observed in less than one year age group of animal, is attributed to the delay in the development of significant immunity, which is initially low but increases with intensity and duration of exposure of infection. Raza *et al.* [3] observed that the age of animal has a significant influence on the level of risk of gastro-intestinal infections in sheep with higher prevalence in young animal than adult. When the sheep crosses one year of age the infection is removed because of the development of self-cure phenomenon and tend to remain relatively resistant to reinfection; however, constant exposure of some level of infection is required to maintain their resistant status [24]. The high rates of infection with gastro-intestinal parasite in young lambs have been observed by Vlassoff *et al.* [24]. Soulsby [27] opined that previous infection and age of the host afford some protection against reinfection and hence acute disease is usually seen in young animals. Rauf *et al.* [28] in different age group of sheep in government and private managed farms in Pakistan, reported that young animals are more prone to infection with tape worms in comparison to adult animals. Molla and Bandyopadhyay [20] reported that the younger (80.00%) were more susceptible to nematode infection in comparison to older animals (62.50%). The possible reason for the present findings could be due to the fact that, animals in semi intensive management system were grazed in the same pasture with extensively grazing animals; feeding moist pastures in the field until environment temperature rises like those of extensively managed small ruminants in the area.

Sex wise prevalence of GI parasites was higher in male in comparison to female. The findings of the present study are in agreement with the study of other researchers who reported that prevalence of gastro-intestinal parasitic infection of sheep was higher in male than in female [3, 5, 29]. Gulland and Fox [30] observed that the intensity and prevalence of gastro-intestinal helminth parasites infection were higher in male sheep than female, except during lambing season, and it decreased as age progresses in both sexes. Female lambs have been reported to be more resistant to GI infection and had lower egg per gram count than male after puberty, although there appears to be no differences between sexes before puberty. Raza *et al.* [3] reported that males were more susceptible to gastro-intestinal parasites in comparison to females. Molla and Bandyopadhyay [20] established that prevalence of gastro-intestinal parasitic infection of sheep was higher in male (76.67%) in comparison to female (63.33%). Thus while considering the present observation and the findings of other researchers, it seems that although sex plays a significant role in the preponderance of GI parasitic infection but management, environmental and climatic conditions have a greater role to play in the onset of gastro-intestinal parasite in sheep despite the gender difference as reported in the present study and by several researchers in other parts of the world.

The present study indicated highest GI parasitic infection found in Bonpala sheep during the monsoon ($P < 0.05$). It may be due to the presence of adequate moisture and temperature in the environment. Transmission of the infective stages was slow on pastures, but since rainfall, temperature and vegetative ground help to increase transmission of the infective stages occurred with increasing frequency. The development, survival and transmission of eggs and infective larvae of GI parasites are influenced by climatic and environmental factors like, temperature, humidity and precipitation [31]. Parasite burdens reached its highest levelsduring the monsoon. In winter and onwards the infection level decreased because of little or no rain during the period and faecal pellets rapidly dried out causing least chances for infection. It is revealed that rainy and autumn season were best suited for survival and migration of exogenous stages of nematodes [32] and a higher incidence of GI nematode in sheep was recorded during south-west and north-east monsoon [33]. Sanyal and Gour [34] recorded prevalence of *H. contortus* (70%), *T. colubriformis* (20%), *O. venulosum* (20%) and occasional *Strongyloides* in sheep from Tamil Nadu. The migration of infective larvae on grass blades was more

in autumn, where all the pre-parasitic activities were low in winter due to scanty rainfall. In line with this seasonal trend are the observations of various authors [24, 35, 36, 37, 38, 39].

In the present study, the presence of sufficient moisture and optimum temperature conditions during the rainy season favoured the survival of infective larvae in the pasture and higher probability of uptake of the infective larvae leading to highest prevalence rate. The rainy season made the environmental conditions more favourable for the development and survivality of preparasitic stages and led to increased availability of infective larvae in the rainy and post rainy season. High rainfall also helps in providing suitable molarity of salt present in soil which is an important factor for ecdysis [27]. It helps in larval dispersion on herbage which increases the chance of contact between host and larvae [40, 41]. There are several studies which have reported highest GI parasitic infection in rainy seasons [42, 43, 44, 45, 46, 47].

So it may be concluded that age, sex, season and the other associated environmental conditions including temperature and moisture have a greater role to play in the onset of GI parasitic infection in sheep. There are several factors that contribute the parasitic disease at the onset like warm, humid and wet grazing season, the more time animals spend on pasture, poor husbandry practices, inefficient selection of de-wormers and or the development of anthelmintic resistance.

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