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Gastrointestinal parasitic infections in yaks at different farms of humid North-East Himalayan region of Sikkim, India

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Gastrointestinal parasitism represents an obstacle to yak rearing, causing severe damage to herds such as growth retardation, weight loss, low milk yield, and even death (Bam *et al*. 2012). Incidence of parasitic infections in domesticated yaks was reported in Sikkim (Rahman *et al*. 2010, Pal *et al*. 2013 and Pal *et al*. 2014) and Arunachal Pradesh (Goswami *et al*. 2013). In present study gastrointestinal parasitic infections in yaks managed in small scale organized farms under Government and private indigenous farming systems of Sikkim, were noted.

Faecal samples of 971 yaks of both sexes and different ages were collected from 8 different farms situated at the elevation of 4,500 m to 7,000 m amsl of Sikkim between April 2005 to March 2007 and subjected to qualitative and quantitative examinations of gastrointestinal parasites which were identified by examining the eggs (Soulsby 1982).

Of the 971 faecal samples of yaks examined, 179 were found positive for various gastrointestinal parasites, either singly (9.43%) or in mixed infections (14.83%) during the study period with an overall mean EPG of 43.862 and EPG range of 100–700 (Table 1). High egg counts in animals of Yumthang valley farm may be due to the access of animals to the vast grazing land common to other animals of the same village. The high stocking density associated with occasional rainfall in the area favoured an increase in larval population on the pasture which, in turn, increased the worm burden resulting in higher egg counts. The egg counts observed in Government yak farm was due to less stocking density of animals and no accessibility of other animals for grazing in the farm.

The most commonly occurring parasite egg recovered from faeces were strongyle, *Strongyloides*, *Nematodirus*, *Ascaris*, *Moniezia*, *Trichuris* and *Dicrocoelium* spp. About 1.44% animals harboured only coccidian oocysts. Higher rate of infection could be possibly due to conducive agroclimatic conditions, along with constant exposure of infection and availability of infective stage larvae on the grazing ground of animals (Rahman *et al*. 2010, Byanju *et al*. 2011, Pal *et al*. 2013). Contrastingly, comparatively less prevalence of *Amphistome* spp. probably has been attributed to less availability of the intermediate hosts or constant deworming against soft bodied trematodes in the alpine dry zone, seasonal climatic fluctuations, feeding quality, husbandry systems and genetic backgrounds of animals. The prevalence of strongyle infection was higher as compared to *Nematodirus* and *Strongyloides* spp. Amongst strongyle, *Haemonchus contortus* emerged as most prevalent species in all the farms, besides *Oesophagostomum*, *Bunostomum* and *Trichostrongylus* spp. were also being isolated from yaks. Ranga Rao *et al*. (1994) and Kuchai *et al*. (2010) also reported similar observations as they found 3 species of trematode and cestode, respectively, and 10 species of nematodes and reported infection in 75% yaks with predominant infection of *Haemonchus contortus* and other strongyles and amphistomes from Sikkim. Hogg (2004) reported prevalence of gastrointestinal nematodes in yaks to be greater than 20%. The highest infection rate of nematode and coccidian (average 56.7%) in yaks was reported from China (Yunfei *et al*. 2004). The present study indicated the same trend, but the months differed owing to different climatic conditions and timing of the onset of monsoon in the region.

The age and sex variables were significant ($P<0.20$) in the development of gastrointestinal helminthiasis. Animals over 6 months of age were more likely to develop those parasites in both the farms than the animals over 24 months of age. This might be due to the fact that with the advancement of age, vigor of the animal become stronger and they develop high resistance against the parasitic diseases (Kuchai *et al.* 2010, Rahman *et al.* 2010, Shrestha 2013, Pal *et al*. 2014). In the gender category, 19.8% of females were infected. This may be because of the fact that females were more prone to gastrointestinal parasitism during pregnancy and pre-parturient period due to stress and decreased immune status.

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Table 1. Prevalence and the mean faecal egg counts of gastrointestinal parasites in different yak farms of Sikkim

Name of the farms	Number of animal examined	Number of animal positive (%)	EPG Range/ Mean EPG	EPG category (%)		
				Low	Moderate	Severe
Government yak farm, Zema-II, North Sikkim	42	7(16.7)	100–700/44.583	2(4.46)	4(9.52)	1(2.38)
Private yak farm, Yakthang, North Sikkim	36	7(19.44)	100–700/32.452	5(13.88)	2(5.56)	-
Private yak farm, Gnathang, East Sikkim	792	148(18.67)	100–600/82.783	57(7.21)	89(11.24)	2(0.25)
Private yak farm, Yumthang, North Sikkim	17	4(23.53)	100–700/85.247	1(5.88)	3(17.65)	-
Private yak farm, Zadong North Sikkim	12	1(8.33)	0–200/18.223	1(8.33)	-	-
Private yak farm, Namnasa North Sikkim	31	5(16.13)	100–400/38.542	1(3.23)	4(12.9)	-
Private yak farm, Kupup, East Sikkim	18	4(22.22)	100–700/55.55	1(5.56)	2(11.11)	1(5.56)
Private yak farm, Thanggu, North Sikkim	23	3(13.04)	100–200/16.222	2(8.7)	1(4.35)	-
Total	971	179(18.43)	100–700/43.862	70(7.21)	105(10.81)	4 (0.11)

Table 2. Season-wise prevalence and degree of EPG of gastrointestinal parasites in Government and privately managed yak farms of Sikkim

Name of the farms	Season	No. of samples	No. positive (%)	EPG category (%)		
				Low	Moderate	Severe
Yak reared in Government farm	Spring (March-May)	8	1 (12.5)	1 (12.5)	-	-
	Summer (June-Aug)	11	3 (27.27)	1 (9.09)	2 (18.18)	-
	Autumn (Sept-Nov)	10	2 (20.0)	1(10.0)	1 (10.0)	-
	Winter (Dec-Feb)	13	1 (7.69)	1 (7.69)	-	-
Yak reared in privately managed farm	Spring (March-May)	189	35 (18.52)	11(5.92)	18 (9.52)	6 (3.17)
	Summer (June-Aug)	244	59 (24.18)	18(7.38)	31(12.71)	10 (4.1)
	Autumn (Sept-Nov)	231	46 (19.91)	16(6.93)	23 (9.96)	7 (3.03)
	Winter (Dec-Feb)	265	32 (12.08)	11(4.15)	21(7.92)	-
Total						
	Spring (March-May)	197	36 (18.27)	12(6.09)	18 (9.52)	6 (3.17)
	Summer (June-Aug)	255	62 (24.31)	19(7.45)	33(12.94)	10 (4.1)
	Autumn (Sept-Nov)	241	48 (19.92)	17(7.35)	24 (9.96)	7 (3.03)
	Winter (Dec-Feb)	278	33 (11.87)	12(4.32)	22 (7.91)	-

A significantly higher prevalence rate was encountered during the summer than that of autumn and spring while significant difference were found in degree of EPG between the summer and winter (Table 2). The prevalence in the present study was highest in monsoon for yaks and lowest during winter. With the beginning of the winter from December onwards, the mean total EPG count steadily decreased to a minimum level of 4.32% EPG in January then it again increased gradually with the increase in temperature and rainfall. The low to moderate faecal egg counts observed during winter may be due to periodical expulsion of worm eggs without the appearance of eggs in faeces. Further, the low EPG counts may be associated with a condition of hypobiosis occurring in adverse environmental conditions during which the parasite survived in the host as arrested larvae.

The rise in strongyle EPG could be attributed to a more favourable temperature and humidity for the development and survival of the preparasitic stages leading to increased availability of infective larvae on the pasture during the subsequent months. The present observation was in accordance with Rahman *et al*. (2010) and Pal *et al*. (2013) in yaks in Sikkim in the humid North-East Himalayan region of India, Bam *et al*. (2012) in yaks of Arunachal Pradesh of India, Goswami *et al*. (2013) from high altitudes of Arunachal Pradesh and Gnathang and Kupup area of East Sikkim. The variation in the prevalence might be due to changes in agroclimatic differences in the management practices followed in the 2 states. The egg count data revealed that the highest risk of GI parasites and pasture contaminations was from July to October.

The data generated in this study indicated that under prevailing agroclimatic conditions of Sikkim, the prevalence of GI nematodes was slightly high among yaks and further investigation on epizootiology of gastrointestinal parasites in yaks in high alpine region, larval bionomics and pasture burden are required for better understanding of GI parasitism in the region.

SUMMARY

Yaks (971) from 8 farms were systematically sampled. The study showed the overall infection rate of 18.43% in yaks, either in single (9.43%) or mixed infection (14.83%) with mean eggs per gram of faeces (EPG) of 43.862. The incidence was significantly lower in Government yak farm (16.7%) than that of privately managed farms (18.51%). The highest prevalence (23.53%) was noticed in private yak farm at Yumthang, North Sikkim. Strongyles,

Strongyloides, Nematodirous and *Ascaroid* spp. were the most prevalent parasites. Higher rate of gastrointestinal parasitic infections was also found in animals at Kupup village (22.22%) than in yaks reared at Gnathang valley in East Sikkim, and a greater proportion of study animals had moderate EPG (10.81%). Age and sex were significant variables for the development of gastrointestinal parasites; 15.37% of animals over 24 months of age and 19.8% of females were found infected. The seasonal distribution of gastrointestinal parasitism indicated a higher percentage of infection during summer (24.31%) followed by autumn (19.92%) and spring (18.27%). The infection rate was significantly lower in winter (11.87%). The present results may be useful to formulate an appropriate management strategy for gastrointestinal parasites of yaks in Sikkim.

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