

Occurrence of gastrointestinal parasites in domestic yaks in Sikkim

H RAHMAN¹, P PAL² and S BANDYOPADHYAY³

ICAR Research Complex for NEH Region, Sikkim Centre, Gangtok, Sikkim 737102 India

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ABSTRACT

Occurrence of gastrointestinal parasites in domesticated yaks of North and East districts of Sikkim was studied during the year 2001 to 2008. Of the 4,792 animals examined, 991 (20.68%) were found positive for different gastrointestinal parasites. The overall occurrence of different parasites recorded was strongyles (17.36%), *Strongyloides* spp. (4.34%), coccidia (4.55%), *Toxocara* spp. (2.25%), *Trichuris* spp. (2.88%), amphistomes (0.52%) and *Moniezia* spp. (3.07%). The infestation was more in Sub-Alpine low humid area (29.34%) as compared to Alpine dry zone ((19.0%) and Cold Desert zone (10.05%). The faecal egg counts (eggs per gram, epg) of nematodes ranged from 100 to 2 900, with higher loads during rainy and post-rainy seasons. The infection was higher in calf (1–5 months) and the parasites mostly recorded were *Haemonchus* spp., *Toxocara* spp. and *Eimeria* spp. The seasonal distribution of parasitism indicated a higher percentage of infestation in autumn (26.02%) and summer (21.57%) as compared with spring (20.65%) and winter (13.73%). On coproculture of positive samples, the nematode infestations in order of prevalence were *Haemonchus*, *Bunostomum*, *Oesophagostomum* and *Nematodirus* spp.

Key words: Gastrointestinal parasites, Prevalence, Sikkim, Yaks

Yak (*Poephagus grunniens*), native of Tibet, is reared (3000–6700 masl) in West Kameng and Tawang districts of Arunachal Pradesh; West, North and East districts of Sikkim; Lahul, Spiti and Kinnaur districts of Himachal Pradesh and Ladakh of Jammu and Kashmir (Pal and Barari 1994) and is known for its ability to withstand low temperature, surefootedness and capability to thrive on coarse fodder at higher altitude where no other ruminant can survive (Katiyar and Sinha 1982). The yak is the only species, which produces milk, meat, hair fibre and provides transport (camel of snow) for trade and agricultural production, serves as financial asset and security for investment and family ceremonies. This prized animal is considered to be an efficient converter of forest biomass into valued beef (Rahman *et al.* 2007). Yak is exceptionally a hardy animal and can withstand severe winter with snowy environment. Yak farming has been recognized as an important source of livelihood for various pastoral tribes of Gaddis in Himachal Pradesh, Gujjars and Bakarheals in Jammu and Kashmir (Jithendran and Bhat 1996) and Rai, Lepchas and Limbus in Sikkim of Eastern most Himalayan region of Indian Subcontinent.

In Sikkim, yak population is around 6 521 (Livestock

Census 2003) and they are reared in the Northeastern ranges bordering Tibet and Bhutan and the Western region bordering Nepal. Three kinds of yaks are described in Gazettier of Sikkim, Lho-guag, larged size yak is found in the Western Sikkim; Bho-gyag (smaller in size than Lho-guag); and the third kind called A-gu are polled yaks seen in high altitude areas of North and Eastern ranges of Sikkim (Katiyar and Sinha 1982).

Yaks are maintained mainly on grazing. They graze during the day time and sit down at intervals for rumination. Migratory system of grazing is in practice. In winter, yaks are taken to a lower altitude grazing land (<3000 masl), which is shared by other domesticated animals. Probably due to this reason, yaks become exposed to many of the diseases particularly those affecting cattle. The occurrence of many of the common diseases of cattle has been reported in yaks (Lensch 1996). However, the information in yaks with particular reference to health is very scarce. There are 2 limiting factors for this, firstly, the remoteness and inaccessibility of yak tracts and secondly, the migratory system of yak husbandry. Due to these limiting factors, mortality and morbidity data on yak diseases could not be recorded and the light of the modern health management practices has not reached to most of the yaks herdsmen. Gastrointestinal parasitism in livestock is common and economic losses due to parasites are enormous, mainly due to morbidity and mortality. The present study was undertaken

Present address: ¹Joint Director, ²Research Associate, ³Senior Scientist, Veterinary Parasitology, IVRI Eastern Regional Station, 37 Belghachia Road, Kolkata, West Bengal 700 033 India.

to ascertain the occurrence of gastrointestinal (GI) parasitic infestation in yaks in Sikkim as monitored by faecal egg counts.

MATERIALS AND METHODS

Sikkim covers a total land area of 7,096 sq. km. between 27°46' – 28°7'N and 88° – 88.5°E and has an altitude range of 300–7500 m amsl.

The investigation was carried out between April 2001 and March 2008 on randomly selected yaks of different ages and both sexes in East and North Hill districts of Sikkim.

The study was conducted in 11 villages including Gurudongmar (7 238 m asl) at North Sikkim (latitude 28°5' N; longitude 28°4' E; altitude 3 200–6 670 masl) and Gnathang (5 258 masl) at East Sikkim where temperature varies from subzero to minus 20°C during winter and spring and then rises slowly from June to November (summer and autumn). The rainfall normally begins in mid April and extends up to October with heaviest spell from June to August. In the Alpine pasture snowfall usually occurs between mid October to early April with heavy spell from December to March.

Faecal samples from 4 792 animals were collected randomly from 11 villages and brought to the laboratory and stored at 4° C until analysed. Faecal samples were subjected to qualitative and quantitative examination for gastrointestinal parasites during 7 years from 2001 to 2008. The animals were of various ages and belonged to individual farmers or Private/Government farm. Most of the farmers sell their animals during the local festival called Losong, so the exact age, lactation and other history of the most of the subjects were not known. The faecal egg counts (eggs per gram of faeces, epg) of nematode eggs was determined by Modified McMaster technique (MAFF 1984), while fluke (amphistome and *Dicrocoelium*) egg counting was done as per Soulsby (1982). Representative number of faecal samples were pooled in equal quantities and used for coproculture at 20°C. The infective larvae were harvested and used for larval identification.

RESULTS AND DISCUSSION

The present study revealed that out of 4 792 animals tested from 3 agroclimatic zones of Sikkim, 991 (20.68%) were positive for various intestinal parasites either singly or in mixed infestation (Table 1). The occurrence of gastrointestinal parasites was higher (29.34%) among animals reared at a lower altitude Sub - Alpine low humid zone (3 000 m amsl) than those reared at higher altitude Alpine dry humid zone (19%, 4 286 m masl) and lowest incidence (10.05%) were noticed in Dry high cold desert zone in North District of Sikkim (above 6 667 m amsl). Statistical analysis indicated a significant difference ($P < 0.05$) in the occurrence of intestinal parasitism among animals reared at different agroclimatic zones (Table 1). An overall

Table 1. Influence of altitude on the occurrence of gastrointestinal parasites in yaks

Agroclimatic zone (Altitude)	No. of animals examined	No. of animals found positive (%)
Sub-Alpine low humid zone (2 200–4 285 m amsl)	1077	316 (29.34)
Alpine dry zone (4 285 – 6 667 m amsl)	3367	640 (19.0)
Dry High cold Desert zone (7 6667 m amsl)	348	35 (10.05)
Total	4792	991 (20.68)

low rate infestation with gastrointestinal parasites in yaks recorded in the cold desert area might be due to uncondusive agroclimatic conditions prevailing in these selected areas of study, which does not favour the propagation of the parasitic ova leading to unavailability of infective larvae on the grazing ground. The overall occurrence of different parasites recorded is presented in Table 2. The most commonly occurring parasites in the region were Strongyle (17.36%) followed by *Eimeria* spp (4.55%), *Strongyloides* spp (4.34%), *Moniezia* (3.07%), *Trichuris* spp. (2.88%), Amphistomes (0.52%) and *Dicrocoelium* spp (0.25%). Among strongyles, *Haemonchus* spp. was most prevalent parasite than other nemaodes, *Toxocara* spp (2.88%). No relationship could be observed between the presence of a particular species and the time of year or sex of the host. The higher rate of infestation could be possibly due to conducive agroclimatic conditions, constant exposure of infestation and availability of infective stage larvae on the grazing ground by animals. The present findings are in agreement with those reported by Katiyar *et al.* (1981), Ansari *et al.* (1989), Ranga Rao *et al.* (1994) and found 3 species of trematodes and cestodes 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. The comparatively less

Table 2. Overall prevalence of gastrointestinal parasites recorded in yaks in Sikkim (N= 4,792)

Parasite	Infected animals (%)*
Nematodes	Strongyles 832 (17.36)
	<i>Strongyloides</i> spp. 208 (4.34)
	<i>Toxocara</i> spp. 108 (2.25)
	<i>Trichuris</i> spp. 138 (2.88)
Cestodes	<i>Moniezia</i> spp. 147 (3.07)
Flukes	Amphistomes 25 (0.52)
	<i>Dicrocoelium</i> spp. 12 (0.25)
Protozoa	<i>Eimeria</i> spp. 218 (4.55)
Total	991 (20.68)

- * Total numbers and overall percentage of an animals exceed expected values because of multiple gastrointestinal parasitism.

Table 3. Occurrence of gastrointestinal parasites in yaks – season-wise

Season	Animals examined	Animals infected (%)
Spring (March – May)	736	152 (20.65)
Summer (June – August)	1386	299 (21.57)
Autumn (September- November)	1410	367 (26.02)
Winter (December- February)	1260	173 (13.73)
Total	4792	991 (20.68)

prevalence of amphistome and *Dicrocoelium* spp. ova in the present study was probably due to less availability of the intermediate host. *Haemonchus* spp. emerged as the most prevalent species in the region with *Bunostomum*, *Oesophagostomum* and *Nematodirus* also being common in yaks.

The observations on monthly seasonal fluctuation of prevalence (per cent positive samples) and mean monthly faecal egg counts are summarised in Tables 3 and 4. Out of 991 positive samples subjected to faecal egg counts for gastrointestinal parasites, the count ranged from 100–2 900 epg with higher prevalence (28.09%) and the overall mean epg (160.56) were recorded during rainy and post rainy season. The occurrence of helminths specially strongyles was high throughout the period of study with a peak during September to November. With the onset of winter season from December onwards, the mean total egg count fell to a low level, steadily falling to a minimum of 42.08 mean epg in January after that it rose slowly with the increase in temperature and rainfall. The prevalence of gastrointestinal parasites did not show a marked seasonal variation in the present study. However, the occurrence of parasites was minimum (13.73%) during winter (December-February) and higher levels were recorded during autumn (26.02%) followed by summer (21.57%) and spring (20.65%). The rise

Table 4. Average monthly prevalence and EPG of gastrointestinal parasites in yaks

Month	No examined	No. infected (%)	Mean epg	Range of mode
January	382	55 (14.39)	42.08	100–500
February	257	56 (9.98)	45.416	100–700
March	87	9 (12.31)	52.214	100–300
April	324	52 (16.04)	58.993	100–400
May	325	91 (28.01)	88.324	100–700
June	516	86 (16.66)	115.678	200–700
July	292	76 (26.02)	57.353	100–2200
August	578	137 (23.7)	152.62	100–1300
September	372	76 (26.03)	124.846	100–1800
October	591	166 (28.09)	160.56	100–2900
November	447	125 (27.96)	65.42	100–900
December	621	62 (10.08)	60.253	100–300
Total	4792	991 (20.68)	111.75	100–2900

Table 5. Influence of age on the occurrence of gastrointestinal parasitism in yaks

Animal group (age wise)	Animals examined	Animal infected (%)
Group A (1–5 months)	804	256 (31.84)
Group B (6 months –2 years)	1 506	286 (19.0)
Group C (above 2 years)	2 482	449 (18.09)
Total	4 792	991 (20.68)

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 study also indicated that, under normal conditions, the animals harboured a worm burden without any clinical signs, but the worm burden reached a threshold pathogenic level in the monsoon and postmonsoon seasons (Jithendran and Bhatt 1999). The egg count data revealed that September to October were the months with the highest risk of GI parasites and pasture contaminations.

The influence of age on the prevalence of GI parasites in yaks revealed that the infestation was higher (31.84%) in yaks at 1–5 months of age followed by in animals of 6 months to 2 years of age (19.0%) and in those of above 2 years of age (18.09%, Table 5).

The coprocultural studies showed that yaks harboured some highly pathogenic nematode species of which strongyle was maximum (Table 6). The most predominant nematode species were *Haemonchus* (37.5%), *Bunostomum* (14.06%), *Oesophagostomum* (12.5%) and *Nematodirus* species (7.81%). The present findings are in agreement with those of Katiyar *et al.* (1981) and Ansari *et al.* (1989).

The data generated in this study indicated that under prevailing agroclimatic conditions of Sikkim, India, the occurrence of gastrointestinal parasites is slightly high among yaks. However, the EPG estimated in the present study indicated the level of subclinical infestations in the host

Table 6. Incidence of gastrointestinal nematode infection through the faecal larval culture in yaks (N= 64)

Species identified	Per cent larval composition (%)
<i>Haemonchus</i> spp.*	24 (37.5)
<i>Bunostomum</i> spp.	9 (14.06)
<i>Oesophagostomum</i> spp.	8 (12.5)
<i>Nematodirus</i> spp.	5 (7.81)
Other strongyle spp.	18 (28.16)

*The species were confirmed on the basis of morphometric characteristics of released larvae (L₃) after coproculture, and percentage of bursate (strongyle) worms were calculated out of total strongyle reported in the host species.

species and may initially be of help for planning chemotherapeutic and prophylactic strategies for yaks from the area studied and also for the regions with similar climatic conditions. Further, investigations 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.

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