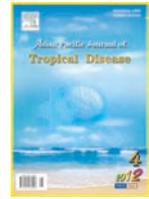




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Seasonal prevalence of parasitic infection of yaks in Arunachal Pradesh, India

Joken Bam¹, Sourabh Deori¹, Vijay Paul¹, Debasis Bhattacharya^{1*}, Asit K Bera¹, Leema Bora², Kishore Kumar Baruah¹

¹NRC on Yak, Dirang, Arunachal Pradesh– 790 101, India

²College of Veterinary Sciences, Assam Agricultural University, Khanapara, India

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ABSTRACT

Objective: To investigate seasonal prevalence of parasitic infection of yak in two yak rearing districts (West Kameng and Tawang) of Arunachal Pradesh, India. **Method:** Study was based on identification of parasitic ova/oocysts through coproscopy and isolation and identification of organisms on necropsy. During the period under report a total of 895 faecal samples were collected and samples were examined both by floatation and sedimentation techniques. **Results:** Out of 895 sample faecal samples, 5.47% samples were positive for protozoa and helminth infections. Infection was the highest during spring followed by rainy, autumn and winter seasons. The highest prevalence was of *Strongyle* (51.02%) followed by *Eimeria* (34.69%), *Trichuris globulosa* (14.28%), *Strongyloides* (10.20%), *Dicrocoelium* and *Mammomonogamus laryngeus* (8.16% each) amphistome and *Toxocara vitulorum* (6.12% each) and *Fasciola gigantica* (4.08%). On necropsy unilocular cysts of *Echinococcus granulosus* and adult worms of *Fasciola gigantica* were isolated and identified. **Conclusions:** Analysis of data revealed that, infection was more in unorganised herd compared to organised herd. In this communication report of *Mammomonogamus laryngeus* seems to be the first report from India.

1. Introduction

Seasonal changes are ubiquitous in parasitic diseases. Numerous factors are known to cause and influence seasonal prevalence dynamics. The most common extrinsic factor includes physical conditions such as weather as community context of the host parasite system i.e. interactions with other members of community[1,2].

Yak is the most important livestock for Brokpa (a pastoral community of Monpa tribe, whose professional and livelihood is dependent on yak rearing and moving them from grazing from one place to another) community of Monpa tribe inhabiting in the Western part of Arunachal Pradesh i.e. Tawang and West Kameng districts[3]. The animal species is well adapted to extreme cold weather due to even distribution of subcutaneous fat[4]. Yak is the sole source of income for

brokpas living in the extreme climatic conditions. In India, yak is reared in Arunachal Pradesh, Sikkim, Himachal Pradesh, Jammu & Kashmir and Uttarakhand[5].

A perusal of available literature revealed that, gastro-intestinal parasitic infection of yak has been depicted in the literature from North Sikkim and Ladakh[6,7]. But both the literature has remained silent about seasonal prevalence of gastrointestinal parasites of yaks. Therefore, the present study has dealt with critical appraisal of seasonal prevalence of gastrointestinal parasite in two districts of Arunachal Pradesh, India both in organized and unorganized herd.

2. Materials and methods

2.1. Study area and animal population

Study was conducted in Tawang and West Kameng districts of Arunachal Pradesh, India which is situated in eastern most part of India. Two districts cover an area of 9 594 sq km situated between 26° 54' to 28° 01' North latitude and 90° 30' to 92° 42' east longitude and contributes its boundary with two yak rearing countries, China on the north and Bhutan on

*Corresponding author: Debasis Bhattacharya, Senior Scientist, National Research Centre on Yak, Dirang–790101, Arunachal Pradesh.
E-mail : debasis63@gmail.com

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the West. Arunachal Pradesh is a generally hilly region. The elevation of the hills ranges from 60 metres to over 7 300 metres (GORICHEN peak in West Kameng). The territory falls in outer Himalayas and Patkoi ranges[8]. The seasons and rainfall in Arunachal Pradesh is divided into four seasons *i.e.* winter (December to February), spring (March to May), rainy (June to August) and autumn (September to November). The number of yaks in Tawang and West Kameng districts are 7 132 and 803, respectively[9].

2.2. Collection and processing of samples

Samples were collected during 2010–2011 during all the four seasons.

2.2.1. Collection of faecal samples

During the period of study a total of 895 samples were collected either from the rectum or freshly voided faeces were taken into consideration. Out of 895 samples, 650 and 245 samples were collected from West Kameng and Tawang districts, respectively. Samples were brought to the laboratory maintaining cold chain. The samples were examined both by floatation and sedimentation techniques.

2.2.2 Collection of samples during necropsy

During the period under report(2010–2011) post mortem examination of 71 yaks were carried out. The samples were examined for parasites. The abomasum, small and large intestines were examined thoroughly for parasites. In brief, aforesaid morbid materials were placed individually into a separate tray. Each segment was opened and washed thoroughly in phosphate buffer saline (PBS) (pH7.2) and examined under a microscope. Parasites were collected, preserved and cleaned in lactophenol and examined microscopically for identification.

Table 3

Parasite wise seasonal prevalence in yak of Arunachal Pradesh (n=49).

Parasite species	Winter	Spring	Rainy	Autumn	Total	Area
<i>Strongyle</i>	2	12	5	6	25 (51.02%)	West Kameng
<i>Eimeria</i>	2	2	12	1	17 (34.69%)	West Kameng, Tawang
<i>Trichuris globulosa</i>	–	5	1	1	7 (14.28%)	West Kameng
<i>Strongyloides</i>	–	4	1	–	5 (10.20%)	West Kameng
<i>Dicrocoelium</i>	–	–	4	–	4 (8.16%)	West Kameng, Tawang
<i>Mammomonogamus laryngeus</i>	–	3	1	–	4 (8.16%)	West Kameng
<i>Toxocara vitulorum</i>	–	–	2	–	3 (6.12%)	West Kameng, Tawang
<i>Amphistome</i>	–	1	2	–	3 (6.12%)	West Kameng
<i>Fasciola gigantica</i>	–	1	0	1	2 (4.08%)	West Kameng

Table 4

Seasonal prevalence of parasitic fauna in organized and unorganized herds.

Location	Winter	Spring	Rainy	Autumn	Total
Organised farm	1/152 (0.66%)	1/51 (1.96%)	9/150 (6.00%)	1/153 (0.65%)	12/506 (2.37%)
Unorganized farm	3/128 (2.34%)	15/64 (23.43%)	11/93 (11.82%)	8/104 (7.69%)	37/389 (9.51%)
Total	4/280 (1.42%)	16 /115 (13.91%)	20/243 (8.23%)	9/257 (3.50%)	49/895 (5.47%)

3. Results

Out of 895 samples, 49 samples(5.47%) were positive for protozoa and helminth infections. Presences of parasite ova or oocysts in the faecal samples were recorded and infection was the highest (13.91%) in the spring followed by rainy (8.23%), autumn (3.50%) and winter seasons (1.42%). Seasonal prevalence of parasitic infection along with their sample size has been depicted in Table 1.

Table 1

Season wise prevalence of parasites in yak of Arunachal Pradesh.

Season	No. of samples	No. positive
Winter (December to February)	280	4 (1.42%)
Spring (March to May)	115	16 (13.91%)
Rainy (June to August)	243	20 (8.23%)
Autumn (September to November)	257	9 (3.50%)
Total	895	49 (5.47%)

Subsequently this was found that, out of 650 samples collected from West Kameng district 5.69% animals were found positive for gastrointestinal parasites. A total of 4.89% yak were found positive on coproscopy when samples collected from Tawang were analysed in the laboratory. The details district wise seasonal prevalence of gastrointestinal parasites in two districts of Arunachal Pradesh has been depicted in Table 2.

Table 2

District wise seasonal prevalence of parasites in yak.

Season	West Kameng		Tawang	
	No. of samples	no.of positive (%)	No. of samples	no. of positive (%)
Winter	229	4 (1.74%)	51	0
Spring	92	13 (14.13%)	23	3 (13.04%)
Rainy	147	13 (8.84%)	96	7 (7.29%)
Autumn	182	7 (3.84%)	75	2 (2.66%)
Total	650	37 (5.69%)	245	12 (4.89%)

Further analysis of data revealed that, the highest prevalence was of *Strongyle* (51.02%) followed by *Eimeria* (34.69%), *Trichuris*

globulosa (14.28%), *Strongyloides* (10.20%), *Dicrocoelium* & *Mammomonogamus laryngeus* (8.16% each), amphistome & *Toxocara vitulorum* (6.12% each) and *Fasciola gigantica* (4.08%). Seasonal prevalence of different genera and species of parasites has been detailed through Table 3.

This has been also revealed that, infection was more in unorganised farm compared to organised farm. The details seasonal prevalence of parasites in organised and unorganised farm has been depicted in Table 4.

After conducting necropsy in organised farm this has been revealed that, out of 48 animals, three female animals were positive for *Toxocara vitulorum* and *Fasciola gigantica*. On the contrary yaks reared under traditional system by Monpa tribe, *Hamonchus contortus* was isolated from abomasum, *Trichostrongylus*, *Nematodirus* and *Trichuris* were identified

in the intestine and *Fasciola gigantica* was isolated from the liver. After examination of lungs, unilocular cysts of *Echinococcus granulosus* and *Fasciola gigantica* were isolated and identified from liver of dead animals (Table 5, Figure 1).

Table 5

Helminth parasites recovered from yak at necropsy.

Yak reared in different system	No. Examined	No. Positive	Parasites recovered
Organised farm			<i>Toxocara vitulorum</i> and <i>Fasciola</i>
Male	36	–	
Female	12	3	
Yak reared in Traditional system			<i>Trichuris</i> , <i>Fasciola</i> , <i>Haemonchus</i> , <i>Nematodirus</i> , <i>Trichostrongylus</i> , <i>Hydatid cyst</i>
Male	15	11	
Female	8	4	



Figure 1. Isolated organisms during necropsy of yaks.

a) Germinal membrane of hydatid cyst, b) *Trichuris* spp., c) *Fasciola*, d) *Toxocara vitulorum*.

4. Discussion

For centuries, the yak and their hybrids (dzomo/dzo) have been contributing to the socioeconomic status of their owners in two districts (Tawang and West Kameng) of Arunachal Pradesh. So far parasitic diseases of yak is concerned, helminth infections has been reported from time to time by different group of workers. In general the major risk factors of helminthosis can broadly classified as parasitic factors (including epidemiology of the different species), host factors (genetic resistance, age and physiological status of the animals) and environmental factors (climate, nutrition, stocking density and management)[10].

During the present endeavour parasitic and environmental factors have been taken into consideration since critical appraisal of seasonal prevalence of the parasite has been taken into consideration for the first time from Arunachal Pradesh, India systematically. Although initial signature on gastrointestinal parasites have indicated helminth infections in yak of Arunachal Pradesh but the study has not indicated about necropsy finding[11]. Since of late Bandyopadhyay *et al*[6] have reported gastrointestinal helminths in yaks reared in Sikkim both in organised and traditionally managed yaks. But in their study they have only screened parasitic infection through coproscopy. But present endeavour has dealt with both coprological examination and necropsy finding. On the contrary a perusal of available literature revealed that, systematic

study on parasites of yak has been conducted in Ladakh (Jammu & Kashmir), Sikkim and villages near the Indo–Nepal border of Uttar Pradesh. The authors reported gastrointestinal protozoa, nematodes, trematodes, cestodes and metacestodes (*Coenurus* spp. and *Echinococcus granulosus*) but they could not find any haemoprotista of pathogenic importance[7]. Our finding also corroborates with the finding of RangaRao *et al*[7] because during the present endeavour we have identified gastrointestinal helminths and protozoa. Besides by necropsy we have isolated metacestodes of zoonotic importance and liver fluke infection. Moreover, identification of *Mammomonogamus largeus* in 8.16% yak seems to be the first report from India. Likewise metacestodes of zoonotic importance has been also reported earlier from Sikkim[12] which also affirms with our present finding.

Besides report on parasitic diseases of yak within political boundary of India, parasitic infection of yak has been reported from Bhutan, Nepal and PR China. Coneurosis has been reported as an important parasitic infection[13]. But we could not report this organism since we have not examined the brain tissue. Like our finding on hydatidosis, this tapeworm has been also reported from Nepal[14]. Like hydatidosis, high prevalence of fascioliasis has been reported from PR China and Nepal during 90's and also in this century[15–18]. During our present investigation we could also find *Fasciola* (4.08%) and other fluke residing in the liver (*Dicrocoelium dendriticum*). But both Indian and foreign literature have remained silent about the latter organism. This particular finding suggests that, hepatic disorder in yak may occur due to both *Fasciola* and *Dicrocoelium* of yak in Arunachal Pradesh. Likewise, round worm has been reported from China[16,17,19] and Bhutan[20].

Considering the present scenario of parasitic infection in yak this may be concluded that, yak in Arunachal Pradesh suffers from mixed parasitic infection of both veterinary and zoonotic importance which demands intervention through chemotherapy, pasture management and control of parasitic infection of canine.

Conflict of interest statement

We declare that we have no conflict of interest.

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