



Prevalence of gastro-intestinal helminths in cattle at north Kashmir

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ABSTRACT

Copro samples (1,126) of locally reared cattle at north Kashmir (Baramulla, Kupwara and Bandipora) were examined over a period of 1 year by qualitative and quantitative techniques. The overall prevalence of gastrointestinal (GI) helminths was 59.86% with trematodes, cestodes and nematodes in 11.63, 4.44 and 53.02% animals, respectively. Paramphistomes (7.10%) were the most prevalent trematodes followed by *Fasciola* spp. (4.53%) and *Dicrocoelium* spp. (0.27%). Prevalence of *Moniezia* spp. the only cestode found in the study was 4.44%. Among nematodes, the prevalence of strongyle worms was the highest (49.91%) followed by *Trichuris* spp. (3.64%) and *Strongyloides* spp. (2.04%). Seasonal variation revealed significantly highest prevalence of GI helminths during spring (68.21%) followed by autumn (67.50%), summer (55.59%) and winter (48.21%). Overall young cattle had significantly higher prevalence (68.13%) than adult animals (55.10%) but trematode infection was significantly higher in adults. Overall GI helminths were non-significantly higher in females (60.56%) as compared to males (58.24%) but the prevalence of paramphistomes was significantly higher in females. The prevalence of *Dicrocoelium* spp. and all the nematodes was nonsignificantly higher in males. EPG was ranging between 0 and 400 with an average EPG of 177.44±6.29. Highest EPG was recorded in spring (231.11±14.15) followed by summer (211.11±11.56), autumn (148.00±11.15) and winter (132.73±8.32). On coprocultural examination, *Haemonchus* spp. (65%) was found to be the most predominant strongyle worm followed by *Bunostomum* spp. (20%) and *Trichostrongylus* spp. (15%).

Key words: Cattle, GI helminths, North Kashmir, Prevalence

Animal husbandry and dairying activities contribute about 30% to the national GDP in India (Anonymous 2013). Byproducts and wastes from farm animals are also valuable plant nutrients to the soil serving as sustained crop-livestock integrated system (Kalyanasundaram 2014). Milk is the primary source of income from cattle rearing in India but the production is not at all optimum given the huge cattle resources India possesses. The reasons can be attributed to many factors like poor genetic potential, over stocking, adverse climatic conditions, low nutritional standards and traditional husbandry practices (Wadhwa *et al.* 2011). It is further aggravated by various clinical and sub-clinical diseases caused by various bacteria, viruses and parasites. Helminth infection, especially the gastrointestinal (GI) parasitism is one of the major health problems severely limiting the productivity and health of dairy animals. In spite of the significant production losses, which may run into millions of rupees (Shan and Chaudhry 1995), the problem is neglected due to its insidious and chronic nature. The incidence of GI parasitic infections reported in

ruminants in India ranged between 25 and 78% (Bandyopadhyay *et al.* 2010). The prevalence of GI parasites in cattle depends upon the local climatic conditions and the managerial practices adopted in that area. It is, therefore, necessary to map out the parasitic fauna of cattle from every geographical area for development of suitable control measures. It is well established that controlling parasitic infections in animals can substantially increase their body weight and productivity (Fitzpatrick 2013). The incidence of parasitic infection in dairy cattle from Jammu region was reported by Raina *et al.* (1999), Yadav *et al.* (2005) and Mir *et al.* (2013) and from Kashmir Valley by Sharma *et al.* (1989), Mir *et al.* (2003), Pandit *et al.* (2004), Fatima *et al.* (2012) and Bushra *et al.* (2013). These studies are restricted to southern and central zones of Kashmir valley and no such work has been carried out in north zone of the valley. Therefore, the present study was undertaken to work out the prevalence of GI helminths of cattle in north Kashmir to evolve a package of practices for control of these parasites in order to prevent economic losses.

MATERIALS AND METHODS

Study area: The study was conducted on locally reared cattle in north Kashmir comprising Baramulla, Kupwara and Bandipora district. The north Kashmir is situated at an average height of 5,226 to 5,541 ft. above sea level and at

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74.3°E longitude and 34.2°N latitude. The climate is of temperate type with cold snowy winters and pleasant weather in summer. Average minimum and maximum temperature varies from (-5 to -2.08°C) to (16 to 23°C). The average annual rainfall is 100.89 to 103.87 mm.

Parasitological examination: Copro samples (1,126) were collected directly from the rectum of locally reared cattle of north Kashmir for a period of one year and were brought to the laboratory in mini polythene bags. The samples collected from above mentioned 3 districts during all the 4 seasons, viz. summer (July-August), autumn (September-November), winter (December-February) and spring (March-May) were first examined grossly for colour, consistency, presence of blood, mucus and dead worms and then by standard sedimentation and floatation techniques (Soulsby 1982). The samples were collected from adult (age>1 year) and young cattle (age<1 year) of either sex.

Randomly selected 25% positive faecal samples in each season from either sex including both the age groups were then examined by quantitative technique (Stoll's dilution method) to determine the parasitic load i.e. EPG (Eggs per gram) (Soulsby 1982). In each season, randomly selected 25% faecal samples positive for strongyle worm type eggs were subjected to coproculture using petridish method (Sahai 1960) and the third stage larvae were harvested to find out prevalence of different genera of strongyle worms using key morphological features described by Van-Wyk *et al.* (2004).

Statistical analysis: The results were subjected to standard statistical analysis as per Snedecor and Cochran (1994). The data on the prevalence between different groups was analyzed using 'z' test of proportions. Mean EPG between sexes and age groups was compared by student's 't' test while as ANOVA was used to compare EPG between the seasons.

RESULTS AND DISCUSSION

The prevalence of GI helminths was studied taking into consideration the overall prevalence, seasonal variation, age and sex of animals.

Overall prevalence: The present study revealed 59.86% overall prevalence of GI helminths (Table 1). This is in accordance with Yadav *et al.* (2005) and Mir *et al.* (2013) who recorded similar findings in cattle of Jammu. Jyoti *et al.* (2011) and Shirale *et al.* (2008) also reported similar prevalence in cattle of Punjab and Maharashtra region, respectively. However, results differed from the study of Laha *et al.* (2013) and Kaur and Kaur (2008) who recorded prevalence of 25 and 82.35% in central dry zone of Meghalaya and Patiala district of Punjab, respectively. The variation in the present study might be due to differences in geographical locations and climatic conditions of the study area, sample size, breed of animals and managerial practices involved.

In the present study, prevalence of trematodes was found to be 11.63%. Among trematodes, prevalence of paramphistomes was the highest followed by *Fasciola* spp.

Table 1. Overall, age-wise, sex-wise and seasonal prevalence of GI helminths of cattle in North Kashmir

Season	Host	No. of samples examined	Number positive for GI helminth	Trematodes			Cestodes		Nematodes			Mixed infection		
				F	D	P	Total	M	Total	S	St		T	Total
Summer	Adult	154	86	3	0	12	15	6	6	78	3	4	82	20
	Young	132	73	2	1	4	7	5	5	66	4	6	71	15
	Total	286	159(55.59 ^a)	5(1.75 ^a)	1(0.35)	16(5.59 ^a)	22(7.69 ^a)	11(3.85)	11(3.85)	144(50.35 ^b)	7(2.45 ^{ab})	10(3.50 ^{ab})	153(53.50 ^b)	35(12.24 ^b)
Autumn	Adult	178	120	11	0	19	30	12	12	97	4	8	104	31
	Young	102	69	2	0	7	9	5	5	62	1	7	63	14
	Total	280	189(67.50 ^b)	13(4.64 ^b)	0(0.00)	26(9.29 ^b)	39(13.93 ^b)	17(6.07)	17(6.07)	159(56.79 ^b)	5(1.79 ^{ab})	15(5.36 ^b)	167(59.64 ^b)	45(16.07 ^b)
Winter	Adult	202	83	15	2	11	27	1	1	63	0	3	63	9
	Young	78	52	3	0	1	4	7	7	41	2	1	46	5
	Total	280	135(48.21 ^a)	18(6.43 ^b)	2(0.71)	12(4.29 ^a)	31(11.07 ^{ab})	8(2.86)	8(2.86)	104(37.14 ^a)	2(0.71 ^a)	4(1.43 ^a)	109(38.93 ^a)	14(5.00 ^a)
Spring	Adult	181	105	13	0	22	33	5	5	82	3	2	86	22
	Young	99	86	2	0	4	6	9	9	73	6	10	82	18
	Total	280	191(68.21 ^b)	15(5.36 ^b)	0(0.00)	26(9.29 ^b)	39(13.93 ^b)	14(5.00)	14(5.00)	155(55.36 ^b)	9(3.21 ^b)	12(4.29 ^b)	168(60.00 ^b)	40(14.29 ^b)
Overall	Adult	715	394(55.10 ^a)	42(5.87 ^b)	2(0.28)	64(8.95 ^b)	105(14.69 ^b)	24(3.36 ^a)	24(3.36 ^a)	320(44.76 ^a)	10(1.40 ^a)	15(2.10 ^a)	335(46.85 ^a)	82(11.47)
	Young	411	280(68.13 ^b)	9(2.19 ^a)	1(0.24)	16(3.89 ^a)	26(6.33 ^b)	26(6.33 ^b)	242(58.88 ^b)	13(3.16 ^b)	26(6.33 ^b)	26(6.33 ^b)	262(63.75 ^b)	52(12.65)
	Total	1126	674(59.86)	51(4.53)	3(0.27)	80(7.10)	131(11.63)	50(4.44)	50(4.44)	562(49.91)	23(2.04)	41(3.64)	597(53.02)	134(11.90)
Sex-wise	Male	340	198(58.24)	14(4.12)	1(0.29)	16(4.71 ^a)	30(8.82)	11(3.24)	11(3.24)	181(53.24)	7(2.06)	13(3.82)	186(54.71)	43(12.65)
	Female	786	476(60.56)	37(4.71)	2(0.25)	64(8.14 ^b)	101(12.85)	39(4.96)	39(4.96)	381(48.47)	16(2.04)	28(3.56)	411(52.29)	91(11.58)
	Total	1126	674(59.86)	51(4.53)	3(0.27)	80(7.10)	131(11.63)	50(4.44)	50(4.44)	562(49.91)	23(2.04)	41(3.64)	597(53.02)	134(11.90)

Figures within parenthesis indicate percentage. Values with different superscript in a column under a subgroup vary significantly (P<0.05). F, *Fasciola* spp.; D, *Dicrocoelium* spp.; P, Paramphistomes; M, *Moniezia* spp.; S, Strongyle worms; St, *Strongyloides* spp.; T, *Trichouris* spp.

and *Dicrocoelium* spp. Among cestodes, the only genus reported in the present study was *Moniezia* with a prevalence of 4.44% (Table 1). The observed prevalence of Paramphistomes is comparable to the findings of Yadav *et al.* (2010) and Hassan *et al.* (2005) in cattle of Delhi and Punjab, respectively. Sahoo *et al.* (2002) reported low prevalence of *Fasciola* spp. in grazing cattle of Odisha. However, Ephrem *et al.* (2012) reported prevalence of *Fasciola* spp. to be 25.2% in Dessie municipal abattoir in Ethiopia. Akram and Najma (2001) found 0.5% of cattle positive for Dicrocoeliosis in district Charsaddah of Pakistan whereas Pandit *et al.* (2004) and Bushra *et al.* (2013) reported prevalence of *Dicrocoelium* spp. in cattle of Kashmir valley to be 4.16 and 2.08%, respectively. A similar type of prevalence rate of *Moniezia* spp. was reported by Bushra *et al.* (2013) from cattle of central zone of Kashmir valley as recorded in the present study, whereas Hirani *et al.* (1999) observed a prevalence rate of only 0.11% in Kheda district of Gujarat. The reason for low prevalence rate of snail borne trematodal infection can be attributed to the fact that the maximum animals are either stall fed or grazed in apple orchards, hence, minimizing the chances of exposure to the infective metacercarial stages present on the vegetation in the vicinity of water bodies.

Overall prevalence of nematode parasites in the present study was 53.02%. The prevalence of strongyle worms was highest followed by *Trichuris* spp. and *Strongyloides* spp. (Table 1). Shirale *et al.* (2008) also reported similar prevalence of nematodes in western Vidarbha region of Maharashtra. Higher strongyle infection was reported by Chowdhury *et al.* (1993) in Dhaka and Mamatha and D'souza (2006) in Bengaluru. Similarly, predominance of strongyle group of worms was also reported by Pandit *et al.* (2004) and Bushra *et al.* (2013) in Kashmir Valley and by Yadav *et al.* (2005) in R S Pura, Jammu. Lower prevalence of *Strongyloides* spp. could be due to development of immunity against parasite as little exposure of *Strongyloides* infection leads to marked immunity (Soulsby 1982). Bushra *et al.* (2013) also reported higher prevalence of *Trichuris* spp. in comparison to *Strongyloides* spp. from central Kashmir and similar findings were reported by Chowdhury *et al.* (1993) and Palamapalle *et al.* (2003) from Bangladesh and Marathwada region of Maharashtra, respectively. The highest prevalence of nematodes particularly strongyle worms in the present study is because of the fact that these worms are prolific egg layers and take lesser time for completion of life cycle and thus grazing areas become heavily infected with the larvae of strongyle worms within a period of fortnight.

Seasonal prevalence: Highest prevalence of GI helminths was observed in spring followed by autumn, summer and winter. The variation was statistically significant ($P < 0.05$) between summer and autumn, summer and spring, autumn and winter, spring and winter (Table 1). This is in accordance with the findings of Sreedevi (2012) in and around Tirupati, Andhra Pradesh. Similarly, Yadav *et al.* (2005) observed the highest prevalence in rainy

season in Jammu. In this study, low prevalence in winter season might be due to hypobiosis and overwintering of parasitic stages because of lowered environmental temperatures in winter and when spring arrives, there is resumption of development of hypobiotic larvae as well as overwintered larvae in grazing areas and thus establishment of heavy infection occurs.

Higher trematode infection was found each in autumn and spring followed by winter and summer, respectively; the variation being significant ($P < 0.05$) between summer and autumn, summer and spring (Table 1). The results are in agreement with the findings of Yadav *et al.* (2010) who reported highest prevalence of trematodes in spring season in Delhi and Khan and Maqbool (2012) who reported highest prevalence in autumn in Punjab and Pakistan. Among trematodes, paramphistomes revealed the highest prevalence rate in autumn and spring followed by summer and winter; the variation being significant ($P < 0.05$) between summer and autumn, summer and spring, autumn and winter, spring and winter (Table 1). The reason can be attributed to the fact that during spring and autumn environmental conditions in Kashmir valley are very favourable for hatching of ova, the viability of encysting metacercariae and survival of snails. *Fasciola* spp. showed a different seasonal activity with a higher prevalence in winter followed by spring, autumn and summer; the variation being statistically significant ($P < 0.05$) among summer and autumn, summer and winter, summer and spring (Table 1). Similar findings were observed by Yadav *et al.* (2005) from Jammu, Khan and Maqbool (2012) from Punjab, Pakistan and Bushra *et al.* (2013) from central Kashmir. The reason for highest prevalence in winter is due to the fact that environmental conditions in Kashmir in autumn are very favourable for hatching of eggs and survival of metacercariae of *Fasciola* spp. The animals actually pick up the infection during autumn and parasites reach to sexual maturity during winter months and as harsh conditions of winter lower the immune resistance of the animal, the infection increases and therefore, egg detection becomes possible. Prevalence of *Dicrocoelium* spp. was found non-significantly ($P > 0.05$) higher in winter followed by summer. *Dicrocoelium* spp. was not found in autumn and spring season. *Moniezia* spp. showed a highest infection rate in autumn and lowest in winter. A prevalence rate of 5.00 and 3.85% was observed in spring and summer season, respectively, the variation being nonsignificant ($P > 0.05$) (Table 1).

The prevalence of nematodes was highest in spring followed by autumn, summer and winter. The variation was statistically significant ($P < 0.05$) between winter and summer, winter and autumn, winter and spring (Table 1). Sultana *et al.* (2013) also reported prevalence of nematode infection highest in spring and least in winter from Rajshahi district. After winter period, spring rise is evident and in Kashmir valley having temperate type of climate, the rainy season starts in spring making environmental conditions more favourable for the development and survival of pre-

parasitic stages of nematodes, resumption of development of hypobiotic larvae and availability of overwintered larvae on herbage leading to overall increased availability of infective larvae in spring season. The prevalence of strongyle worms was highest in autumn followed by spring, summer and winter; the variation being statistically significant ($P < 0.05$) between winter and summer, winter and autumn, winter and spring. *Trichuris* spp. followed a similar pattern revealing higher prevalence rate in autumn, followed by spring, summer and winter; the variation being statistically significant ($P < 0.05$) between autumn and winter, winter and spring. Highest prevalence of *Strongyloides* spp. was found in spring followed by summer, autumn and winter. The variation was statistically significant ($P < 0.05$) between winter and spring (Table 1).

Age-wise prevalence: Overall prevalence was found more in young cattle compared to adults. The study revealed statistically significant difference between the two age groups ($P < 0.05$) (Table 1). Similar findings were made by Haque *et al.* (2011), Bushra *et al.* (2013) and Maharana *et al.* (2015) from western Punjab, Kashmir valley and Gujarat, respectively.

The prevalence of trematodes was found significantly ($P < 0.05$) higher in adults compared to young cattle (Table 1). This is in agreement with the findings of Chowdhury *et al.* (1993) in Bangladesh, Yadav *et al.* (2005) in Jammu region, Fatima *et al.* (2012) and Bushra *et al.* (2013) from Kashmir valley. This can be due to the reason that young animals are less grazed in water logged areas and are thus less exposed to infective stages of trematodes. The higher trematodal infection in adults can also be because of built up of infection in adults due to repeated exposures. *Fasciola* spp., paramphistomes and *Dicrocoelium* spp. were also found higher in adults as compared to young cattle; the variation being statistically significant ($P < 0.05$) for *Fasciola* spp. and paramphistomes. *Moniezia* spp. showed a higher prevalence in young cattle compared to adults, the variation being statistically significant ($P < 0.05$) (Table 1). Similar findings were made by Bushra *et al.* (2013), Haque *et al.* (2011) and Singh *et al.* (2008) in different regions of north India. It is a universally accepted fact that lambs, kids and calves under six months of age are substantially infected by tapeworms as compared to adults due to development of immunity by the later.

Nematodes were found higher in young cattle than adults, the variation being statistically significant ($P < 0.05$). Strongyle worms were also found significantly ($P < 0.05$) higher in young cattle compared to adults. *Strongyloides* spp. and *Trichuris* spp. followed similar trend with higher prevalence in young cattle as compared to adults, the variation being statistically significant ($P < 0.05$) (Table-1). These findings are in accordance with Yadav *et al.* (2005) and Bushra *et al.* (2013). The low prevalence of nematode infection in adults might be due to development of age resistance.

Sex wise prevalence: Out of 340 and 786 samples, 58.24 and 60.56% samples in males and females, respectively,

were found positive for GI helminths, the variation being non-significant ($P > 0.05$) (Table 1). Maharana *et al.* (2015) also observed higher prevalence in females in Junagadh, Gujarat. Overall higher female infection is due to the fact that females are more prone to physiological stresses like pregnancy and lactation which results in temporary relaxation of immunity and makes them more susceptible to parasitic infection.

The prevalence of trematodes was found non-significantly ($P > 0.05$) higher in females than males. *Fasciola* spp. and paramphistomes were found higher in females than males, the variation being significant ($P < 0.05$) for paramphistomes (Table 1). Current findings are in line with the study of Chowdhury *et al.* (1993), Singh *et al.* (2008) and Bushra *et al.* (2013) who also observed higher prevalence of trematodes in females from Bangladesh, Faizabad and central Kashmir, respectively. *Dicrocoelium* spp. showed a different activity with higher prevalence in males compared to females; the variation being non-significant ($P > 0.05$). *Moniezia* spp. showed non-significantly ($P > 0.05$) higher prevalence in females as compared to males.

Nematodes were found non-significantly ($P > 0.05$) more in males than females. Strongyle worms were also found non-significantly ($P > 0.05$) higher in males compared to females. *Strongyloides* spp. and *Trichuris* spp. also followed similar trend with higher prevalence in males compared to females, the variation being non-significant ($P > 0.05$) (Table 1). Chowdhury *et al.* (1993) in Bangladesh and Bharkad *et al.* (1999) in Maharashtra also observed higher prevalence of nematodes in males.

Parasitic load: EPG ranged from 0 to 400 with an average of 177.44 ± 6.29 (Table 2). The average EPG was found highest in spring followed by summer, autumn and winter. The variation was statistically significant ($P < 0.05$) between summer and autumn, summer and winter, autumn and spring, winter and spring (Table 2). This observation goes in agreement with Bushra *et al.* (2013) who observed highest average EPG in spring season in central Kashmir. In this study, the highest EPG count in the spring season may be due to the spring rise phenomenon (Soulsby 1982).

The average EPG was found significantly higher ($P < 0.05$) in young cattle than adults (Table 2). Our findings are in agreement with Bushra *et al.* (2013) who also observed higher infection in young cattle in central Kashmir. This might be due to the development of acquired immunity by the adults as compared to young ones in which immune system is not yet fully developed. The average EPG was significantly ($P < 0.05$) higher in females than males (Table 2). This is because females experience periparturient and post-parturient rise in faecal egg counts due to pregnancy and lactation stress. In lactating animals, there is also marked increase in susceptibility to newly acquired infections (Shubber *et al.* 1981).

Coproculture examination: On coprological examination, *Haemonchus* spp. (65%) was found to be the most predominant strongyle worm followed by

Table 2. Overall, age-wise, sex-wise and seasonal comparison of parasitic load of GI helminths of cattle in north Kashmir

Season	Host	No. of samples screened	EPG range	Mean EPG
Summer	Adult	30	0-300	193.33±14.33
	Young	15	100-300	246.67±16.52
	Total	45	0-300	211.11±11.56 ^b
Autumn	Adult	30	0-300	136.67±14.77
	Young	20	0-300	165.00±16.66
	Total	50	0-300	148.00±11.15 ^a
Winter	Adult	33	0-200	121.21±11.31
	Young	22	100-200	150.00±10.91
	Total	55	0-200	132.73±8.32 ^a
Spring	Adult	32	0-400	218.75±17.06
	Young	13	100-400	261.54±24.12
	Total	45	0-400	231.11±14.15 ^b
Overall	Adult	125	0-400	167.20±89.60 ^a
	Young	70	0-400	195.71±9.85 ^b
	Total	195	0-400	177.44±6.29
Sex-wise	Male	67	0-400	153.73±9.82 ^a
	Female	128	0-400	189.84±7.91 ^b
	Total	195	0-400	177.44±6.29

Values with different superscript in a column under a subgroup vary significantly ($P < 0.05$).

Bunostomum spp. (20%) and *Trichostrongylus* spp. (15%). Predominance of *Haemonchus* spp. was also reported by Borthakur and Das (1998) in Asom; Yadav *et al.* (2008) in Uttarakhand and Bushra *et al.* (2013) in Kashmir valley. This is because of the fact that the females of *Haemonchus* spp. are prolific egg layers (Urquhart 1996) and infective stages of *Haemonchus* spp. survive for prolonged periods on pastures (Soulsby 1982). However, Jitendran and Bhat (1999) have reported predominance of *Trichostrongylus* spp. over *Haemonchus* spp. in Himachal Pradesh. Similarly, Mamatha and D'Souza (2006) have reported predominance of *Bunostomum* spp. in cattle and buffaloes of Bengaluru.

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