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Prevalence of gastrointestinal helminths of cattle in south Kashmir

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Parasitic infections inflict heavy losses to livestock industry through mortality, morbidity, reduced feed conversion ratio, inefficiency of production and by way of costs incurred on treatment and control (Shahardar 2013). Since the occurrence of parasitic diseases is greatly influenced by varying climatalogical and ecological factors, therefore the parasitic fauna of each and every region mapped out accurately in various seasons in different species of livestock forms a fundamental information on which further control measures can be based upon. Since there was no information available on GI parasites of cattle in Pulwama District of south Kashmir which is highest producer of milk (218 MT) among all the ten Districts of the Kashmir Valley (Anonymous 2011), therefore the present study was undertaken to work out the prevalence of GI helminths of cattle in different seasons of the year in Pulwama District to evolve a package of practices for control of these parasites to prevent economic losses.

A total of 1163 samples were collected directly from the rectum of animals from all the four tehsils of the District for a period of one year from September 2014 to August 2015. The samples after gross observation were examined in laboratory by standard sedimentation and floatation techniques (Soulsby 1982). Randomly selected 25% positive faecal samples in each season were examined by quantitative technique (Modified Mc Master's technique) to determine the parasitic load (EPG). Similiarly, 25% of faecal samples positive for strongyle eggs were subjected to coproculture using petridish method and the third stage larvae were harvested and identified using the key described by van-Wyk *et al*. (2004) to find out prevalence of different genera of strongyle worms. The results were subjected to standard statistical analysis employing 'z' test, student's 't' test and ANOVA.

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

In the present study, overall prevalence of GI helminths was 68.96%.This was in agreement with the findings of Shirale *et al*. (2008), Gupta *et al*. (2012) and Mir *et al*. (2013) who reported almost similar incidence in cattle of Maharashtra, Madhya Pradesh and Jammu region of Jammu and Kashmir respectively. However, Bushra *et al*. (2013) reported higher prevalence rate of 78.02% while Aiman *et al*. (2017) reported lower prevalence of 59.86% of GI helminths in cattle of central and north zones of Kashmir Valley, 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 managemental practices involved.

In the present study, prevalence of trematodes was 13.24%.The prevalence of paramphistomes was highest followed by *Fasciola* spp. and *Dicrocoelium*s spp (Table 1). This finding was in agreement with that of Aiman *et al.* (2017) in north zone of Kashmir Valley. However, the results differed from the study of Shirale *et al.* (2008) and Bushra *et al*. (2013) who reported prevalence of trematodes as 3.71 and 27.39% in western Vidarbha region of Maharashtra and central zone of Kashmir Valley, respectively. The observed prevalence of paramphistomes in the current study was comparable to the findings of Yadav *et al*. (2010), Bushra *et al*. (2013) and Chaudhary *et al*. (2014) in Delhi, central zone of Kashmir Valley and Garhwal region of Uttarakhand, respectively. The prevalence of *Fasciola* spp. observed in the present study was comparable to the findings of Aiman *et al.* (2017) in north zone of Kashmir Valley. The low prevalence of *Dicrocoelium* spp. in the present study was in line with the findings of Aiman *et al*. (2017) in cattle of north zone of Kashmir Valley while Bushra *et al*. (2013) had reported 2.08% prevalence of dicrocoeliosis in cattle of central zone of Kashmir Valley. 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.

Among cestodes, the only genus reported was *Moniezia* spp. with prevalence of 7.99% (Table 1). Almost similar

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

Season	Host	No. of samples examined	No. positive for GI Helminths	Trematodes				Cestodes		Nematodes					Mixed infection
				F	D	P	Total	M	Total	Tv	S	St	T	Total	
Autumn	Adult	185	125	2	0	5	7	11	11	0	123	5	0	123	18
	Young	113	85	1	0	0	1	8	8	0	84	3	4	84	12
	Total	298	210	3	0	5	8	19	19	0	207	8	4	207	30
			(70.47^{B})	(1.01^{A})	(0.00^{A})	(1.68^{A})	(2.68^{A})	(6.38^{A})	(6.38^{A})	(0.00^{A})	(69.46^{B})	(2.68^{A})	(1.34^{A})	(69.46^{B})	(10.07^{A})
Winter	Adult	202	91	4	2	40	43	8	8	0	61	1	2	62	25
	Young	60	40	4	1	2	7	13	13	0	37	3	1	37	9
	Total	262	131	8	3	42	50	21	21	0	98	4	3	99	34
			(50.00^{A})	(3.05^{A})	(1.14^{A})	(16.03^{B})	(19.08^{B})	(8.02^{A})	(8.02^{A})	(0.00^{A})	(37.40^{A})	(1.53^{A})	(1.15^{A})	(37.79^{A})	(12.98^{AB})
Spring	Adult	188	130	7	0	43	48	23	23	0	109	7	3	109	51
	Young	93	84	1	0	4	5	15	15	0	83	03	3	83	22
	Total	281	214	8	0	47	53	38	38	0	192	10	6	192	73
			(76.16^{B})	(2.85^{A})	(0.00^{A})	(16.73^{B})	(18.86^{B})	(13.52^{B})	(13.52^{B})	(0.00^{A})	(68.33^{B})	(3.56^{A})	(2.14^{A})	(68.33^{B})	(25.98^{C})
Summer	Adult	208	146	4	1	27	32	3	3	0	138	1	4	138	30
	Young	114	101	1	0	10	11	12	12	3	96	4	2	97	27
	Total	322	247	5	1	37	43	15	15	3	234	5	6	235	57
			(76.71^{B})	(1.55^{A})	(0.31^{A})	(11.49^{B})	(13.35^{B})	(4.66^{A})	(4.66^{A})	(0.93^{A})	(72.67^{B})	(1.55^{A})	(1.86^{A})	(72.98^{B})	(17.70^{B})
Overall	Adult	783	492	17	3	115	130	45	45	0	431	14	9	432	124
			(62.84^{A})	(2.17^{A})	(0.38^{A})	(14.69^{B})	(16.60^{B})	(5.75^{A})	(5.75^{A})	(0.00^{A})	(55.04^{A})	(1.79^{A})	(1.15^{A})	(55.17^{A})	(15.84^{A})
	Young	380	310	07	01	16	24	48	48	3	300	13	10	301	70
			(81.58^{B})	(1.84^{A})	(0.26^{A})	(4.21^{A})	(6.32^{A})	(12.63^{B})	(12.63^{B})	(0.79^{B})	(78.95^{B})	(3.42^{A})	(2.63^{A})	(79.21^{B})	(18.42^{A})
	Total	1163	802	24	04	131	154	93	93	3	731	27	19	733	194
			(68.96)	(2.06)	(0.34)	(11.26)	(13.24)	(7.99)	(7.99)	(0.26)	(62.85)	(2.32)	(1.63)	(63.03)	(16.68)
Sex-wise	Male	176	140	0	0	6	6	16	16	1	138	3	5	139	28
			(79.55^{B})	(0.00^{A})	(0.00^{A})	(3.41^{A})	(3.41^{A})	(9.09^{A})	(9.09^{A})	(0.57^{A})	(78.41^{B})	(1.70^{A})	(2.84^{A})	(78.98^{B})	(15.91^{A})
	Female	987	662	24	4	125	148	77	77	2	593	24	14	594	166
			(67.07^{A})	(2.43^{A})	(0.41^{A})	(12.66^{B})	(14.99^{B})	(7.80^{A})	(7.80^{A})	(0.20^{A})	(60.08^{A})	(2.43^{A})	(1.42^{A})	(60.18^{A})	(16.82^{A})
	Total	1163	802	24	4	131	154	93	93	3	731	27	19	733	194
			(68.96)	(2.06)	(0.34)	(11.26)	(13.24)	(7.99)	(7.99)	(0.26)	(62.85)	(2.32)	(1.63)	(63.03)	(16.68)

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; Tv, *Toxocara vitulorum*; S, strongyle worms; St, *Strongyloides* spp; T, *Trichuris* spp.

prevalence rate had been by reported by Sahoo *et al.* (2002) from stall fed cattle of Orissa. However, results differed from that of Bushra *et al.* (2013) and Aiman *et al.* (2017) who reported prevalence of *Moniezia* as 4.16 and 4.44% in central and north zone of Kashmir Valley, respectively. Eggs of *Stilesia* spp. and *Avitellina* spp. were not found on faecal examination because it is difficult to find their eggs in faeces as they are contained in thick walled par uterine organs (Bhatia *et al*. 2004), therefore, their presence could not be ruled out.

Overall prevalence of nematode parasites in present study was 63.03%. Amongst nematodes, maximum prevalence was recorded for strongyle worms (62.85%) followed by *Strongyloides* spp. (2.32%), *Trichuris* spp. (1.63%) and *T. vitulorum* (0.26%) (Table 1). The results of present investigation were in close approximation to the findings of Debbarma *et al*. (2013) who reported almost similar prevalence of nematodes in dairy cattle of Jabalpur, Madhya Pradesh. The prevalence of strongyle worms observed in the present study was similar to that observed by Laha *et al.* (2013) in cattle at organized farms of Meghalaya. However, Mamatha and D'souza (2006) in Bangalore reported the prevalence of strongyle worms to be 83.60%. Similarly, predominance of strongyle worms over other nematodes in the present study had also been reported by Yadav *et al*. (2005) in R.S. Pura, Jammu; Chavhan *et al.* (2008) in Nagpur; Bushra *et al*. (2013) in central zone of Kashmir Valley and Aiman *et al.* (2017) in north zone of Kashmir Valley. Prevalence of *Strongyloides* spp. was found slightly higher than that of *Trichuris* spp. in the present study (Table 1). The results were in close approximation to the findings of Mir *et al*. (2003) in cattle of Shopian District of south Kashmir; Shirale *et al*. (2008) from western Vidarbha region, Maharastra; Haque *et al*. (2011) from Punjab and Laha *et al.* (2013) from organized farms of Meghalaya. A low prevalence of *Toxocara* spp. observed in the present study was in close approximation to the findings of Gupta *et al*. (2012) and Bushra *et al.* (2013) from Madhya Pradesh and central zone of Kashmir Valley, 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 infested with the larvae of strongyle worms within a period of fortnight.

The prevalence of GI helminths was highest in summer (76.71%) followed by spring (76.16%), autumn (70.47%) and winter (50.00%), the variation being statistically significant ($P<0.05$) between autumn and winter, summer and winter, spring and winter (Table 1). The results were in agreement with the findings of Hirani *et al*. (2006), Samanta and Santra (2007) and Hafiz *et al*. (2011) in cattle of Gujarat, West Bengal and Kashmir Valley respectively. Low prevalence in winter season is due to hypobiosis and overwintering of parasitic stages because of lowered environmental temperatures and in spring, there is resumption of development of hypobiotic larvae as well as overwintered larvae in grazing areas and in summer conditions are very favourable for survival and development of parasitic stages.

Amongst the trematodes, the prevalence of paramphistomes was highest in spring season (16.37%) (Table 1).The results were in agreement with the findings of Aiman *et al.* (2017) who reported highest prevalence of paramphistomes in spring, season in north zone of Kashmir Valley. The reason can be attributed to the fact that during spring environmental conditions in Kashmir Valley are very favourable for hatching of ova, the viability of encysting metacercariae and survival of snails. The incidence of *Fasciola* spp. was highest in winter (3.05%) followed by spring (2.85%), summer (1.55%), and autumn (1.01%), the variation being statistically non significant ($P>0.05$) between the seasons (Table 1). Higher prevalence rate of *Fasciola* spp. in winter and low intensity during autumn and summer had also been reported by Bushra *et al*. (2013) and Aiman *et al.* (2017) in central and north zone of Kashmir Valley, respectively. The reason for highest prevalence in winter is due to the fact that environmental conditions in Kashmir in summer and autumn are very favourable for hatching of eggs and longevity of metacercariae of *Fasciola* spp. The animals actually pick up the infection during summer and early autumn and parasites reach to sexual maturity in bile ducts during winter after migrating through the peritoneal cavity and liver parenchyma and therefore egg detection becomes possible. *Dicrocoelium* spp. was highest in winter followed by summer season, the variation being statistically non-significant ($P>0.05$). *Dicrocoelium* spp. was not found in autumn and spring seasons. Prevalence of *Moniezia* spp. was highest in spring followed by winter, autumn and summer, variation among seasons was statistically significant ($P<0.05$) between autumn and spring, winter and spring, summer and spring (Table 1).

Prevalence of nematodes was higher in summer (72.98%) followed by autumn (69.46%), spring (68.33%) and winter (37.79%), the variation being statistically significant ($P<0.05$) between summer and winter, autumn and winter, spring and winter. The results were in line with Yadav *et al*. (2005) who observed highest prevalence of nematodes in summer, and Aiman *et al.* (2017) who reported lowest prevalence of nematodes in winter season. The highest prevalence of nematode infections in summer is due to favourable environmental condition for development and survival of free living stages and the lowest prevalence in winter is due to hypobiasis and overwintering of parasitic stages.

In the present study, prevalence of paramphistomes was significantly ($P<0.05$) higher in adults than young ones but prevalence of *Moniezia* spp., *T. vitulorum* and strongly worms were significantly ($P<0.05$) higher in young than adult cattle. As regards to other parasites reported in the study, there were non-significant ($P>0.05$) differences in their prevalence between adults and young ones (Table 1). The low incidence of nematode infection in adults as compared to younger animals is due to development of

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

Season	Host	No. of samples screened	EPG range	Mean EPG
Autumn	Adult	35	100–250	150.00±24.40
	Young	12	0–400	95.83±30.44
	Total	47	0–400	115.79±21.65[a]
Winter	Adult	40	100–200	125.00±25.00
	Young	8	0–150	81.25±18.75
	Total	48	0–200	95.83±15.64[a]
Spring	Adult	48	100–350	200.00±26.73
	Young	8	50–300	143.75±29.03
	Total	56	50–350	171.88±20.40[b]
Summer	Adult	42	125–250	192.86±16.10
	Young	8	100–250	165.63±16.99
	Total	50	100–250	178.33±11.92[b]
Overall	Adult	165	100–350	173.08±12.70[b]
	Young	36	0–400	118.75±13.96[a]
	Total	201	0–400	141.53±10.22
Sex-wise	Male	18	0–400	131.94±19.78[a]
	Female	183	0–350	145.45±12.01[a]
	Total	201	0–400	141.53±10.22

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

immunity due to repeated exposure to infection. In case of *T. vitulorum* infection, patency is short and natural expulsion of adult worms commences as early as 38 days after birth and by four to six months no adult parasites remain, hence restricting the infection to young ones (Soulsby 1982).

In the present study, prevalence of paramphistomes was significantly (P<0.05) higher in females than male animals but prevalence of strongly worms was significantly (P<0.05) higher in males than females. As regards to other parasites reported in the study, there were non-significant (P>0.05) differences in their prevalences between male and female animals (Table 1).

EPG in the present study ranged from 0–400 with mean EPG of 141.53±10.22. Mean parasitic load was highest in summer (178.33±11.92) followed by spring (171.88±20.40), autumn (115.79±21.65) and winter (95.83±15.64), the variation being statistically significant (P<0.05) between summer and autumn, summer and winter, autumn and spring, winter and spring. Our findings were in agreement with Aiman *et al.* (2017) who observed lowest average EPG in winter season.

The mean parasitic load was significantly (P<0.05) higher in adults (173.08±12.70) than young ones (118.75±13.96) (Table 2). The reason for higher EPG in adults is due to long exposure to infection by grazing on contaminated pastures resulting in build up of infection in them. The mean parasitic load was non-significantly (P>0.05) higher in females (145.45±12.01) than males (131.94±19.78) (Table 2) which is in line with Bushra *et al*. (2013) and Aiman *et al.* (2017) who also reported higher EPG in females in central and north zone of Kashmir valley, respectively. The reason for higher EPG in females is because females experience periparturient rise in faecal egg counts due to pregnancy and lactation stress.

On coprological examination, *Oesophagostomum* spp. (46.00%) was the most predominant strongyle worm followed by *Trichostrongylus* spp. (30.00%), *Haemonchus* spp. (13.00%) and *Chabertia* spp. (11.00%). Our observation regarding *Oesophagostomum* spp. is in line with Kaur and Kaur (2008) who also reported predominance of *Oesophagostomum* spp. over other strongyle worms in cattle/buffaloes of Patiala region. However, Bushra *et al.* (2013) and Aiman *et al.* (2017) had reported predominance of *Haemonchus* spp. over other strongyle worms in cattle of central and north zone of Kashmir valley. The prevalence of *Chabertia* spp. reported in the present study is almost similar to that reported by Bushra *et al.* (2013) in cattle of central zone of Kashmir valley.

SUMMARY

A study conducted to find out the prevalence of gastrointestinal (GI) helminths in cattle of District Pulwama of south Kashmir over a period of one year revealed highest prevalence of paramphistomes followed by *Fasciola* spp. and *Dicrocoelium* spp. amongst trematodes. Among cestodes, *Moniezia* spp. was the only parasite observed and amongst nematodes, the prevalence of strongyle worms was highest followed by *Strongyloides* spp., *Trichuris* spp. and *Toxocara vitulorum*. Seasonal prevalence and mean EPG were significantly highest in summer. Similarly, prevalence of GI helminths was significantly higher in young ones and males as compared to adults and females. Coproculture examination revealed predominance of *Oesophagostomum* spp. over the other genera of strongyle worms. On the basis of above study, it is concluded that prophylactic dosing of cattle against fasciolosis during late autumn shall be useful in preventing liver damage and losses caused due to fasciolosis and prophylactic dosing in late winter or early spring shall be useful in reducing contamination of grazing places with *Fasciola* eggs. Similarly, prophylactic deworming of animals in mid-summer, mid-autumn and mid-spring shall be useful in preventing production losses. However, it will be better to use broad spectrum drug which is effective against trematodes, cestodes as well as nematodes to avoid frequent dosing.

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