

Retrospective study on occurrence of bovine gastrointestinal parasitic infections in different regions of Haryana

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ABSTRACT

The production and reproduction of livestock is hampered by the presence of gastrointestinal (GI) parasitic infections. The effect of parasites ranges from anorexia, loss of body condition, anaemia, diarrhoea, protein losing enteropathy and loss of body condition apart from aforementioned direct and indirect effects on the animals leads to huge economic losses to livestock owners. In the present study, a total of 1669 faecal samples from cattle (n=550) and buffaloes (n=1119) with the history of diarrhoea or digestive disturbances were processed for presence of parasitic infections at different disease investigation laboratories (Ambala, Bhiwani, Mahendragarh and Rohtak) of Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana from July 2021 to June 2022. All the faecal samples were processed by floatation and sedimentation methods for detection of parasitic eggs and the results revealed that 29.6% cattle and 34.7% buffaloes were positive for GI parasites. *Buxtonella sulcata* (17.7%), *Amphistomes* (5.2%), and *Strongyles* (6.9%) were the major parasites observed in cattle and buffaloes. The occurrence of parasitic infection was significantly higher ($P<0.05$) in Rohtak followed by Bhiwani, Ambala and the least in Mahendragarh district of Haryana. However, no significant difference ($P>0.05$) between the cattle and buffaloes of geographical regions was observed. Further, analysis of month, season and age influences on prevalence of GI parasites were found to have no significant impact ($P>0.05$). Overall, this study helps to assess the parasitic load within the study region and helps to further devise control strategies against the parasites of bovines.

Keywords: Amphistomes, *Buxtonella sulcata*, GI parasites, Strongyles

India has highest livestock population of the world and this sector plays an important role in Indian economy which contributes to 4.11% of overall Gross Domestic Product (GDP) and 25.6% total agriculture GDP of the country. In rural India, the livestock rearing has been taken as source of side income, insurance against the effect of natural calamities, and availability of fresh and affordable milk and meat products. About 20.5 million people in India depend upon the livestock sector for their livelihood and the livestock sector contribute to 16% of small farm households, apart from providing employment to 8.8% of Indian population (Government of India (GOI), Livestock Census, 2019).

Even though India is number one producer of the milk, the productivity per animal is very low (Press Information Bureau (PIB), GOI, 2022), which currently stands 987 kg per lactation, compared with global average of 2038 kg per lactation (FAO), thus the average milk yield remains well below international standards (Landes *et al.* 2017).

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Multiple factors curtail the production of milk which includes genetics of the animal, nutritional, managerial practices, and diseases (Barkema *et al.* 2015, Erickson and Kalscheur 2020, Espinosa *et al.* 2020). Of the diseases, most overlooked aspect is the gastrointestinal (GI) parasites, which are a major constraint to growth, production and reproductive performance (Maharana *et al.* 2016; Mustafa *et al.* 2022).

The GI parasites include trematodes, cestodes, nematodes, and protozoa which are responsible for clinical and subclinical diseases. The disease may be manifested in the form of digestive disturbances, diarrhoea, inappetence, anorexia, loss of body condition, along with impaired immune system of animals (Das *et al.* 2018). Economic losses are further compounded by the result of mortality, condemnation of carcasses or organs and cost of treatment of diseased animals (Dappawar *et al.* 2020). Even though disease outbreaks of GI parasitic infections do happen but chronic or sub-clinical infections, which do not really represent an immediate threat to the livestock owner or farmers, are responsible for heavy economic losses as compared to clinical outbreaks (Chowdhury and Tada 1994).

Various epidemiological studies have been carried out in different parts of India to assess the parasitic load, and

their effect on the overall economics of livestock industry (Khan *et al.* 2022, Bhanot *et al.* 2023, Terfa *et al.* 2023). Various factors such as age, sex, breed of host, managemental practices and climatic changes affect the prevalence of GI parasites (Zvinorova *et al.* 2016). Only few studies had been carried out in bovines of Haryana to assess the overall parasitic occurrence (Chaudhri *et al.* 2014, Bhanot *et al.* 2023).

To control this neglected problem and minimize the economic losses, data pertaining to occurrence of GI parasites in cattle and buffaloes is required in order to design proper treatment, effective control and prevention strategies against the neglected yet economically important diseases. Therefore, the present research work was carried out to ascertain the occurrence of GI parasites in bovines (cattle and buffaloes) in different regions of Haryana.

MATERIALS AND METHODS

The present study was conducted in four Disease Investigation Laboratories, under Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar, Haryana situated at four districts, viz. Ambala, Bhiwani, Mahendragarh and Rohtak. Haryana, a Northern Indian state, located between 27°37' to 30°35'N latitude and between 74°28' and 77°36' longitude. The study was conducted from July 2021 to June 2022 and divided into four seasons, viz. summer (April, May, June), rainy (July, August, September), spring/autumn (October, November, March) and winter (December, January, February). The selected animals were categorized according to age, viz. young (<6 months) and adult (>6 months). Faecal samples were received from owners bringing in marked glass containers/plastic pouches/vials. A total of 1669 faecal samples of cattle (550) and buffaloes (1119) were collected and screened for detection of parasitic infections. All the faecal samples were examined by flotation and sedimentation techniques (Soulsby 1982). The data obtained from all four laboratories was compiled and was statistically analyzed by IBM SPSS version 26 software. Chi-square test was employed to compare the occurrence

of parasitic infections in bovines with respect to various parameters such as age, month, season, and species. The level of significance was considered at $P < 0.05$ and $P < 0.001$.

RESULTS AND DISCUSSION

A total of 550 cattle and 1119 buffalo faecal samples were tested for coprological examination. Of them, 29.64% cattle ($n=163$) and 34.67% buffaloes ($n=388$) were found positive for GI parasites (Table 1). Species wise, no significant difference ($P > 0.05$) in parasitic infections were observed among cattle and buffaloes of different districts. However, highly significant difference ($P < 0.001$) was found while comparing occurrence of parasitic infections among cattle and buffaloes with respect to different districts (Table 1). Overall, the highest occurrence was found in Rohtak (56.8%) followed by Bhiwani (43.1%), Ambala (26.9%) and the least in Mahendragarh (16.6%) district of Haryana.

Bhanot *et al.* (2023) reported the slightly higher occurrence of GI parasites in cattle (33.50%) and buffaloes (37.30%), respectively from Haryana. The data had been collected similarly from all four labs, situated in different districts, and not much variation was observed. Similar trend was also seen in prevalence of parasitic infections in Sri Lanka, where cattle and buffaloes had prevalence of 11.56% and 31.25%, respectively, even though difference between them was not significant (Gunathilaka *et al.* 2018). Slight variation in the percent positivity in faecal samples from cattle (42%) and buffaloes (36%) was observed in Gujarat (Maharana *et al.* 2016). Similarly, the parasitic infection in cows and buffaloes was respectively 38.1% and 20.3% in Haryana, with cows showing significantly higher infection (Chaudhri *et al.* 2014). In Jammu region, GI parasites were prevalent in 67.15% in cattle and 38.7% in buffaloes (Mir *et al.* 2013). In all of these studies, higher prevalence was reported in cattle than buffaloes, even though higher variation was observed in cattle prevalence. Multiple factors dictate the variation in the prevalence and these includes; geographical location, climatic condition of the study region, length of the investigation, host-parasite

Table 1. Area-wise occurrence (%) of GI parasitic infections in cattle and buffaloes

District/area	Cattle			Buffalo			Statistical significance (among different species of same district/area)		
	<i>n</i>	+ve	%	<i>n</i>	+ve	%	Chi-square	<i>Df</i>	P-value
Ambala	426	117	27.46	367	96	26.16	0.019	1	0.891
Bhiwani	19	6	31.58	83	38	45.78	2.513	1	0.113
Mahendragarh	42	8	19.05	320	52	16.25	0.257	1	0.612
Rohtak	63	32	50.79	349	202	57.88	0.450	1	0.503
Total	550	163	29.64	1119	388	34.67	0.385	1	0.535
Statistical significance (among different districts/area of same species)									
				Chi-square			<i>df</i>		
Between different areas (Cattle)				17.202			3		
Between different areas (Buffalo)				29.671			3		
							P-value		
							0.001**		
							0.000**		

Where, '*df*' degree of freedom; '*n*' total number of samples tested; '+ve' samples positive for parasitic infections; '%' Percentage of positive samples; Level of significance: * ($P < 0.05$), Significant; ** ($P < 0.001$), Highly significant.

relationships, immune status of the animal, managerial practices, and deworming regimen, all of which impact the survival of different stages of the parasites and intermediate hosts, if any (Zvinorova *et al.* 2016).

On the other hand, higher prevalence was found in buffaloes (73%) as compared to cattle (65%) by Gupta *et al.* (2012). A study carried out in and around Hisar, investigated the faecal samples from buffaloes revealed 82.25% parasitic infection and *Eimeria spp.* was most common parasitic infection (Kalkal *et al.* 2020). Few studies carried out in Pakistan on buffalo and cow calves revealed that buffalo calves have more parasitic infection in comparison to cow calves (Bilal *et al.* 2009; Abbas *et al.* 2021). The higher prevalence of GI parasites might be because poor management and hygienic conditions, feeding habits, associated deficiencies such as pica, wallowing habit and easy dispersion of faeces in water, and non-adoption of deworming practices (Bilal *et al.* 2009).

The present study recorded highest parasitic infection of *Buxtonella sulcata* (17.7%), followed by *Strongyles spp.* (6.9%), Amphistomes (5.2%), and mixed infection (1.1%). The other parasitic infection includes *Toxocara spp.*, *Coccidia spp.*, *Ascaris spp.* and *Trichuris spp.* Species wise occurrence of different parasites in cattle and buffaloes is depicted in Table 2. No significant difference was observed in different parasites in cattle and buffaloes. However, highly significant difference ($P < 0.001$) was found while comparing occurrence of parasitic infections among cattle and buffaloes (Table 2).

Slightly higher infection of *Amphistome spp.* was observed in buffaloes (5.54%) as compared to cattle (4.55%). Similar findings have been observed previously by Chaudhri *et al.* (2014), where buffaloes had significantly higher infection of paramphistomes (14.2%) as compared to cattle (9.1%). In a study carried out in Uttarakhand state over a period of seven years revealed similar results, where

slightly higher infection of paramphistomes was observed in buffaloes (17.65%) as compared to cattle (17.14%) (Kumar *et al.* 2011). Chaudhri *et al.* (2014) observed higher prevalence of *Strongyles* in crossbred cattle. Present study revealed similar finding as well, where we have seen the occurrence of 11.09% in cattle as compared to 4.92% in buffaloes. Similarly, higher *Strongyle* infection was observed in cattle (13.3%) than buffaloes (9.91%) by Bhanot *et al.* (2023). Higher occurrence of *Buxtonella sulcata* was noted in buffaloes (21.0%) than cattle (11.09%). Present findings were in agreement with previous observations made in Haryana (Manoj and Singh, 2019), where 34.6% buffalo samples were positive for *B. sulcata* as compared to 25.6% cow samples. The results of current study are also in agreement with Bhanot *et al.* (2023), where *B. sulcata* occurrence of 17.4% and 9.76% was observed among buffaloes and cattle, respectively. In contrast, higher prevalence of *B. sulcata* was observed in cattle (23.6%) than buffaloes (18.5%) in a study carried out in Jammu, India (Ganai *et al.* 2015). Earlier *B. sulcata* was considered as non-pathogenic inhabitant of animal's gut, but lately its association with parasitic diarrhoea had been well-documented (El-Ashram *et al.* 2019).

In cattle, higher parasitic infection was observed during December, July, and September and least during February and June. Whereas, the parasitic burden in buffaloes was highest in the months of March, February, and April and least in May and August months (Table 3). Cattle had significantly higher rate ($P < 0.05$) of parasitic infection than buffaloes in the month of February. The occurrence of parasitic infection did not have significant variations in other months (Table 3). When compared month-wise data on parasitic infections among cattle and buffaloes, no significant variation was observed in the current study (Table 3).

Bhanot *et al.* (2023) observed highest occurrence in

Table 2. Species-wise occurrence (%) of GI parasitic infections in cattle and buffaloes

Parasite	Cattle (n=550)		Buffalo (n=1119)		Statistical significance (among different species of same parasitic isolates)		
	+ve	%	+ve	%	Chi-square	Df	P-value
<i>Amphistome spp.</i>	25	4.55	62	5.54	0.091	1	0.763
<i>Buxtonella sulcata</i>	61	11.09	235	21.00	3.125	1	0.077
<i>Strongyles spp.</i>	61	11.09	55	4.92	2.250	1	0.134
<i>Toxocara spp.</i>	3	0.55	12	1.07	0.000	1	1.000
<i>Coccidia spp.</i>	2	0.36	5	0.45	NA	-	NA
<i>Ascaris spp.</i>	0	0.00	8	0.71	NA	-	NA
<i>Trichuris spp.</i>	1	0.18	1	0.09	NA	-	NA
Mixed infection	10	1.82	10	0.89	0.333	1	0.564
Total	163	29.64	388	34.67	0.385	1	0.535
Statistical significance (among different districts/area of same species)							
			Chi square		df	p value	
Between different areas (Cattle)			38.533		7	0.000*	
Between different areas (Buffalo)			51.571		7	0.000*	

Where, 'df' degree of freedom; 'n' total number of samples tested; '+ve' samples positive for parasitic infections; '%' Percentage of positive samples; Level of significance, *($P < 0.05$) Significant; **($P < 0.001$) Highly significant.

Table 3. Occurrence (%) of GI parasitic infections in cattle and buffaloes depending with respect to various parameters (month, season and age)

Parameter	Cattle (n=550)			Buffalo (n=1119)			Statistical significance (between cattle and buffalo)		
	<i>n</i>	+ve	%	<i>N</i>	+ve	%	Chi square	<i>df</i>	P-value
<i>Month-wise</i>									
July 2021	59	20	33.90	81	27	33.33	0.015	1	0.903
August 2021	54	17	31.48	116	36	31.03	0.000	1	1.000
September 2021	75	25	33.33	111	36	32.43	0.015	1	0.901
October 2021	34	9	26.47	127	46	36.22	1.613	1	0.204
November 2021	34	8	23.53	94	30	31.91	1.143	1	0.285
December 2021	35	13	37.14	96	31	32.29	0.362	1	0.547
January 2022	26	7	26.92	73	24	32.88	0.600	1	0.439
February 2022	32	6	18.75	93	36	38.71	6.897	1	0.009*
March 2022	52	15	28.85	98	41	41.84	2.380	1	0.123
April 2022	39	11	28.21	78	30	38.46	1.515	1	0.218
May 2022	58	19	32.76	79	23	29.11	0.258	1	0.611
June 2022	52	13	25.00	73	28	38.36	2.683	1	0.101
<i>Season-wise</i>									
Rainy	188	62	32.98	308	99	32.14	0.015	1	0.901
Spring/ Autumn	120	32	26.67	319	117	36.68	1.563	1	0.211
Winter	93	26	27.96	262	91	34.73	0.778	1	0.378
Summer	149	43	28.86	230	81	35.22	0.563	1	0.453
<i>Age-wise</i>									
Young (<6 Month)	41	14	34.15	195	92	47.18	2.06	1	0.149
Adult (>6 Month)	509	149	29.27	924	296	32.03	0.148	1	0.701

Where, '*df*' degree of freedom; '*n*' total number of samples tested; '+ve' samples positive for parasitic infections; '%' Percentage of positive samples; Level of significance, *($P < 0.05$) Significant; **($P < 0.001$) Highly significant.

August in cattle and buffaloes whereas least occurrence was observed in the month of January for cattle and in the month of May in buffaloes. Statistically significant variation was reported among cattle and buffaloes when month-wise data was analyzed, in their study. Highest prevalence of GI parasites in bovines was observed in September and least in December (Marskole *et al.* 2016). Degefu *et al.* (2011) observed the prevalence of GI helminthes which was higher in October (wet month) and lower in February. The rainy or post-rainy months favors the larval developments and survival of intermediate hosts, which in turn will aid in propagation of amphistomes. Rainy seasons also favour the development of periparasitic stages of nematodes like *Haemonchus spp.* and *Strongyles spp.*, which might explain the occurrence of parasitic infection close to rainy season (Chaudhri *et al.* 2014). However, no such rationale could be applied for occurrence of *B. sulcata* infection, which is a protozoa and it is present throughout the year.

Season-wise, the occurrence of parasitic infection was highest in bovine during spring/ autumn season. In cattle, data revealed the parasitic infection was highest during rainy (32.9%) followed by summer (28.8%), winter (27.9%) and the least in spring/autumn (22.7%) season. In buffaloes, highest parasitic infection was observed during spring/autumn (36.8%) followed by summer (35.2%), winter (34.7%) and the least in rainy (32.1%) season. Different seasons did not significantly affect the occurrence

of parasitic infection. Similarly, parasitic infection among cattle and buffaloes was not statistically significant ($P > 0.05$) in different seasons (Table 3).

As per the study of Shit *et al.* (2017), carried out in bovines, recorded highest parasitic occurrence in rainy season (67.0%), followed by winter (52.3%) and summer (38.8%) seasons. Maharana *et al.* (2016) registered highest parasitic prevalence in monsoon, followed by summer and winter. As stated earlier that rainy season and subsequent increase in moisture content aids the development of larval stages and intermediate hosts of parasites, causing higher parasitic load and more infection (Wadwa *et al.*, 2011). In contrast, Biswas *et al.* (2013) in Bangladesh, Samanta and Santra (2007) in West Bengal and Mir *et al.* (2013) in Jammu reported high GI parasitic incidence in summer season. In Biswas *et al.* (2013) investigation, there was no much difference between parasitic infections in summer (84.6%) and rainy season (83.6%). This contrast of more cases in summer as compared to rainy season could be explained by the fact that in some studies year was divided into three seasons whereas in other studies year was divided into four seasons, so as a result some overlapping of months and seasons happened.

Young animals (<6 M) had higher occurrence of parasitic infections than adults (>6 M) in both cattle and buffaloes (Table 3). However, no statistically significant difference ($P > 0.05$) was observed between different age

groups. Similarly, occurrence of GI parasites and age did not seem to be significantly associated. Higher prevalence of GI parasitic infection was observed in young of cows and buffaloes (Bilal *et al.* 2009, Abbas *et al.* 2021). Other studies reported the prevalence of GI parasite went up with progression in age (Qureshi and Tanveer 2009; Telila *et al.* (2014).

Gastrointestinal (GI) parasites causes diarrhoea, decreased growth, reproductive setbacks and production deficiencies, all of which are responsible for huge economic loss to livestock owners and GDP of the country. Gastrointestinal parasites produce detrimental effects on the health and productivity of the animals. Therefore, the present study was carried to know the status of often overlooked and economically important GI parasitic infections in bovines (cattle and buffaloes) in different regions of Haryana. These parasitic infections were assessed on the basis of different parameters such as parasite and animal species, area, month, season and age. *Buxtonella sulcata* and *Strongyles spp.* were the major parasitic species observed and highest occurrence of parasitic infection was observed in Rohtak district. No significant difference was observed in month, season and age-wise assessment of data. Overall, this study helps to assess the parasitic load in different regions of Haryana, with an aim to devise parasitic control strategies in bovines.

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