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Prevalence of strongyle infection in goats in and around Jabalpur, Madhya Pradesh

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Abstract
Current investigation was undertaken during the period from October 2021 to January 2022 to assess the prevalence of strongyles infection in goats in and around Jabalpur. The overall prevalence of strongyles was 37.20% with significantly higher rate (p<0.01) in unorganized sector (43.35%) than in organized (31.84%). The strongyle infection was significantly higher (p<0.05) in age group greater than 1 to two years (54.13%) as compared to other age group. Female goats (43.01%) showed significantly higher prevalence (p<0.05) than males (30.26%). The strongyle infection was significantly higher in non-descript breed (58.55%) of goats as compared to other breed. Monsoon (55.36%) seasons were having significantly higher (p<0.05) infection than winter and summer. The coproculture study on strongyle infection of goats revealed that *Haemonchus* spp. (64.05%) was the predominant nematode followed by *Trichostrongylus* spp. (14.20%), *Oesophagostomum* spp. (10.15%), *Strongyloides* spp. (6.43%), and *Bunostomum* spp. (5.17%). The study indicated strongyle infection as one of the major problems that could hamper health and productivity of goats in the study area.

Keywords: Strongyle, prevalence, goats

1. Introduction
In India livestock and agriculture are closely integrated in the predominantly agriculture-based national economy. Among all farm animals, goats have the widest ecological range and have been poor people's most reliable livelihood resource. Grazing ruminants are often exposed to multiple species of parasitic gastrointestinal nematodes (GIN), which cause gastroenteritis (Kassai, 1999) [11]. Gastrointestinal nematodes targeting the abomasum, small and large intestines of sheep and goats include different species of *Haemonchus*, *Ostertagia*, *Teladorsagia*, *Trichostrongylus*, *Nematodirus*, *Oesophagostomum*, *Chabertia* and *Bunostomum* (Zajac, 2006) [25]. Parasitic diseases undoubtedly inflict enormous economic loss annually through morbidity and mortality in the livestock. Gastrointestinal (GI) parasitism directly or indirectly accentuates the economic losses through lowered fertility, compromised work capacity, suppressed food intake, weight gain and milk production, increased treatment cost and mortality in the heavily parasitized animals (Choubisa and Jaroli, 2013) [5]. Hence the present study was undertaken to know the prevalence of strongyle in and around Jabalpur.

2. Materials and Methods
2.1 Location and place of work
The work was conducted in the Department of Veterinary Medicine, College of Veterinary Science & A.H., Jabalpur, Livestock Farm, Amanala, Nanaji Deshmukh Veterinary Science University (NDVSU), Jabalpur Madhya Pradesh and different nearby villages of Jabalpur.

2.2 Duration of work
The study was conducted for a period of fifteen months from October 2021 to January 2022. The study was conducted at Amanala goat farm, N.D.V.S.U, Jabalpur. For this study, a total numbers of 500 goats of organized and unorganized sectors were screened for the symptoms of impaired appetite, weight loss, severe anaemia and persistent diarrhea. Before collection of faecal samples, signalment (age, sex) of the animal was also recorded. Faecal samples were collected in individually labelled polythene bags and taken to the laboratory at the earliest for further examination by standard faecal examination methods i.e., sugar flotation and sedimentation techniques. The faecal samples positive for strongyle infection in a month were pooled area wise and culture in the laboratory by petri dish method.

A drop of preserved sediment containing larvae was placed on a glass slide, mixed with a drop of Lugol's iodine or aqueous Safranin and then examined under dry magnifications of the compound microscope after applying a cover slip over the preparation. 100 L3 parasites were counted and identification of strongyle larvae was done with the help of the key and plates provided by Ministry of Agriculture, Fishery and Food (1971) [16].

2.3 Statistical analysis of the data

The association of different risk factors (i.e., season, age and sex) with the prevalence of parasites was tested employing Chi-square test of independence of attributes. Risk factor correlations with $p<0.05$ were considered significant and $p<0.01$ were considered highly significant (Snedecor and Cochran, 1994) [21].

3. Results and Discussion

Overall prevalence of strongyles in goats in and around Jabalpur was 37.20 per cent. These findings are in agreement with Zivinorava *et al.* (2016) [26], Das *et al.* (2017) [7], and Anugrah *et al*. (2018) [1] who recorded 31.0 per cent, 32.6 per cent and 38.3 per cent prevalence, respectively. However, higher prevalence of gastrointestinal nematodes was reported by Rupa and Portugaliza (2016) [19], Kusumlata *et al*. (2018) [14], Ghimire and Bhattarai (2019) [8], Mohammedsalih *et al*. (2019) [17], and Income *et al.* (2021) [9] as 62.0, 61.4, 59.3, 82.0 and 86.3 per cent, respectively.

Prevalence of gastrointestinal parasites was recorded significantly higher ($p<0.01$) in unorganized sector (43.35%) than under organized (31.84%). These findings are in close agreement with Pant *et al.* (2009) [18] who reported higher prevalence in the small household goats (96.15%), compared to farm goats (90%). Singh *et al.* (2016) [20], Kusumlata *et al.* (2018) [14] surprisingly found higher prevalence in the farm goats, compared to field goats. The variation in the prevalence rate may be attributable to regular use of broad-spectrum anthelmintic drugs in the well-managed organized farms under veterinary supervision by the well-informed animal attendants with appropriate nutritional support and preventive measures.

Age wise prevalence study had showed the prevalence rates of 61/152 (40.13%) in the 0-1 year, 72/133 (54.13%) in >1-2 years, 32/105 (30.48%) in >2-3 years, and 21/110 (19.09%) in over 3 years age groups goats, Analysis of data revealed significantly higher prevalence in the >1-2 years of age group, followed by animals in the age groups of 0-1 year and >2-3 years. The lowest values were recorded in the over 3 years of age group animals. The enigmatic differences in the prevalence rate of strongylosis in goats (present and previous reports) are ascribable to gross variation in the geo- climatic conditions in different locations, and managerial protocols. Similar findings are on record (Rupa and Portugaliza, 2016 [19]; Kusumlata *et al*., 2018 [10]; Anugrah *et al*., 2018 [1] and Limbat *et al*., 2022) [15]. Adult goats were more prone to strongyle burden, compared to the young ones. On the contrary, many other investigators (Urquhart *et al*., 1996 [23]; Vlassoff *et al.*, 2001 [24] and Khajuria *et al.*, 2012) [12] reported that younger goats less than 1 year in age were more prone to infection, *cf*. the older ones.

Gender wise, the prevalence rates of 69/228 (30.26%) in males and 117/272 (43.01%) in females were recorded. Thus, the intensity of infection was significantly ($p<0.05$) higher in females, compared to males. Temporary loss of acquired immunity against gastrointestinal nematodes near the parturition time, physiological stress associated with parturition and lactation in female animals reduce the immune tolerance to infections (Blood and Radostists, 2000) [3]. Female gender predisposition observed in the present study is consistent with the published reports: 73.21% (Chavan *et al.*, 2008) [4] and 53.67% (Kuchai *et al.*, 2011) [13]. However, Bhat *et al.* (2012) [2] reported that male sheep have higher prevalence (75.6%) than the females.

The data on gastrointestinal strongyles revealed significantly ($p<0.05$) higher prevalence in non- descript breed (58.55%) compared to the established breeds of goats. These observations are in general agreement with reports of Dappawar *et al*. (2018) [6] who reported breed-wise prevalence to be 48.93% in non-descript breed and 52.89% in Osmanabadi breed of goats. The variation in the susceptibility to infection with a specified gastrointestinal parasite largely depends primarily on the genetic configuration of the breed and partly on the environment. Susceptibility to any infection also depends on the management practices, topography of the geographic area, drainage of waste water, hygiene and sanitation conditions favourable or otherwise for parasitic development. Thus, variation in the breed-wise prevalence rate of the endoparasite in a particular geographic area is mainly attributable to the genetic make-up of the host animal species.

The season-wise prevalence of gastrointestinal strongyles was studied. The data on gastrointestinal strongyles revealed significantly ($p<0.05$) higher prevalence (55.36%) in monsoon season compared to the winter (30.49%) and summer seasons (20.93%). These findings are in close agreement with the published reports (Bhat *et al.*, 2012 [2]; Khajuria *et al.*, 2012 [12]; Das *et al.*, 2017 [7]; Jas and Pandit, 2017 [10]; Syamala *et al*., 2021) [22]. Climatic conditions and ambient moisture content also significantly modulate the rate of larval development and migration in the host tissues.

The overall composition of caprocultural larvae revealed highest prevalence of *Haemonchus sp*. (64.05%), followed in sequence by *Trichostrongylus sp*. (14.20%), *Oesophagostomum sp.* (10.15%), *Strongyloides sp.* (6.43%) and *Bunostomum sp.* (5.17%). This finding is consistent with the published reports (Singh *et al*., 2016 [20], Das *et al.*, 2017 [7]; Kusumlata *et al.*, 2018) [14]. Agro-ecology and climatic conditions are claimed to play an important role in the development and survival of infective stages of strongyle nematodes in grazing pastures.

Table 1: Prevalence of gastrointestinal parasites in goats

Factor	Level	Examined	Prevalence (%)	Degree of freedom	X2 Value
Sector	Organized	267	85(31.84%)	1	2.54**
	Unorganized	233	101(43.35%)		
Age	0-1	152	61(40.13%)	3	36.24*
	1-2	133	72(54.13%)		
	2-3	105	32(30.48%)		
	3	110	21(19.09%)		
Sex	Male	228	69(30.26%)	1	3.99*
	Female	272	117(43.01%)		
Breed	Barbari	105	39 (37.14%)	4	16.47*
	Sirohi	128	23 (17.97%)		
	Black bengal	67	21 (31.34%)		
	Jamnapari	48	14 (29.17%)		
	Non-descript	152	89 (58.55%)		
Seasons	Winter	246	75(30.49%)	2	8.03*
	Summer	86	18(20.93%)		
	Monsoon	168	93(55.36%)		

Figures in parentheses indicate percentage;
** X 2 values were considered highly significant at $p<0.01$ level

Table 2: Generic distribution of strongyles larvae in and around Jabalpur

Type of strongyle larvae (n=186)	Generic composition (%)
Haemonchus sp	64.05
Trichostrongylus sp.	14.20
Oesophagostomum sp.	10.15
Strongyloides sp.	6.43
Bunostomum sp.	5.17

3. Conclusion

The overall prevalence of strongyle infection was 37.20%. Goats from unorganized sector, female goats, goats of age group greater than 1-2 years of age, non-descript breed of goats and monsoon season had showed higher prevalence of strongyle infection. Moreover the prevalence of *Haemonchus* spp. was higher in and around Jabalpur. This data will help the veterinarians of the area in planning future research and control strategies.

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