

Seasonal Prevalence of Gastrointestinal Helminths in Goats in Lucknow, Uttar Pradesh

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Abstract:

The present study was carried out to investigate the prevalence of gastrointestinal helminths (GI) parasite in goat and its associated determinants (season, age and sex) in Lucknow, Uttar Pradesh. Helminth prevalence was found to be 67.6% in the present research with significantly high nematode infestations (65.1%), followed by trematode (18.3%) and cestode (12.7%). The prevalence rate of different helminth species varied significantly ($p \leq 0.05$) and it was reported that the highest infestation rate was found due to *Haemonchus* sp. (62.3%), followed by *Trichostrongylus* sp. (56.3%), *Oesophagostomum* sp. (36.1%), *Bunostomum* sp. (27.9 %), *Paramphistomum* sp. (18.3%), and *Moneizia* sp. (12.7%). A significant ($p \leq 0.05$) variation in the prevalence rate was detected during monsoon (84.7%) followed by summer (67.7%) and winter (50.4%). Age-wise prevalence indicated younger goats significantly ($p \leq 0.05$) more susceptible (87.5%) than adults (51.3%), whereas in case of gender-wise prevalence significant ($p \leq 0.05$) difference was observed and it was found that females were more prone to the infestation (74.2%) than males (59.6%). The present study revealed that the seasonal variation with associated determinants plays a prominent role in the prevalence of GI helminths of the animals; hence there is an urgent need for proper grazing management and routine prophylactic treatment of goat livestock.

Keywords: Gastrointestinal helminths (GI), Nematode, Trematode, Cestode, Grazing management

INTRODUCTION

Rearing of goats is the primary source of income for many small and marginal farmers worldwide. Goat is the earliest animal domesticated by man and has played a significant role in the socio-economic growth of the country. They are distributed worldwide, especially in tropical areas and in arid zones (Cerbo et al., 2010). Goats are primarily raised for milk and leather (Hasan et al., 2011). Goat livestock production works as a beneficial endeavor in developing countries of the world because of dietary animal protein (Anaeto et al., 2009). Goats as small ruminants have a few advantages over larger ruminants such as cow and buffalo, because of their lesser purchase price, higher fecundity, cheaper to maintain, ability to survive on a substandard diet in adverse conditions (Odogu and Okaka, 2016). Goats, especially those which are not reared properly and allowed to wander freely for grazing are found to be infested with a variety of gastrointestinal parasites with an adverse impact on their growth as well as productivity of the animal. Three parasitic helminth genera, namely nematode (roundworms), cestode (tapeworms) and trematode (flukes) affect the goats and are reported to be more fatal while appearing to be harmless, and lead to severe gastroenteritis, anorexia, abdominal distension, diarrhea, and respiratory disturbances (Junaidu and Adamu, 1997).

Retardation in growth and inadequate amount of meat production also are majorly reported due to these parasitic infestations and in turn results in serious economic losses to the farmers and the Country (Junaidu and Adamu, 1997). Survey of gastrointestinal helminth parasites of dogs of public health importance in Sokoto Metropolis". In Proceedings of the 22nd Annual Conference of the Nigerian Society of Animal Production, Abubakar Tafawa Balewa University Press. In addition to these threats, helminth infestation lowers the animal's immunity and renders it susceptible to other pathogenic infections; and hence, result in serious economic losses (Garedaghi and Rezaii-Saber, 2011). The problem is however more copious in warm countries of the world due to favorable environmental conditions for helminth transmission, such as poor sanitation and inadequate nutrition (Mohanta et al., 2007; Zeryehun, 2012).

Besides, many concomitant factors impact the prevalence of gastrointestinal helminths including age, sex, season and grazing management practices (Raza et al., 2007; Khan et al., 2009). Consequently, high mortality rates as a result of infections by gastrointestinal parasites remain a serious menace to goat production (Perry et al., 2002). Several studies were conducted on the incidence of gastrointestinal parasites of goats in different parts of India and the World where it was reported to be in the range of 25 to 92% (Odogu and Okaka, 2016; Gupta et al., 1987; Saha et al., 1996; Rahman and Ali, 2001; Mamtha and Placid, 2007; Raza et al., 2014). Very few researches on the prevalence of various gastrointestinal parasitic infections of goats in Uttar Pradesh were conducted and especially in Lucknow, no systematic work on these parasites is carried out. A regular and routine epidemiologic survey and proper monitoring are required to find out the intensity of infection (% prevalence) and the clinical effects on livestock (Waller, 2006). In the present study, hence is taken up at Lucknow, UP to generate a baseline data which will be very helpful in formulating an appropriate strategic parasite control program and to effectively control these parasitic infestations and further to minimize the economic losses and domestic goat farming.

MATERIALS AND METHODS

The study was carried out at the Parasitology and Silkworm Pathology Laboratory of Dept. of Zoology (formerly the Department of Applied Animal Sciences) BBAU, Lucknow during November 2014 to October 2016. A total of 355 gastrointestinal tracts were collected from local abattoirs of different parts of Lucknow, Uttar Pradesh. Each and every part of the gastrointestinal tract was examined thoroughly for the helminth parasites by following the method described by (Cable, 1957; Hansen and Perry, 1993). Trematode and cestode parasites were fixed and preserved by following the Mayer and Olsen (1975) method using Cornoy's solution as a fixative. Nematode parasites were preserved by the glycerol-alcohol method using hot (70%) ethanol as a fixative. Further, these parasites were identified using the method described by (Soulsby, 1982) under the microscope according to their morphological features.

Statistical Analysis

SPSS (Version 20) was used to analyse the derived data. The significance of the data was tested through Chi-square analysis with level of significance at ≤ 0.05 .

RESULT

The present research was conducted to investigate the prevalence of parasitic helminths in goats. A total of 355 gastrointestinal tracts were collected and examined for the infestation and it was found that of the total 240 gastrointestinal tracts were found to be infected with different helminth species indicating 67.6% prevalence (Table 1, figure 1). Significantly higher prevalence of nematodes (65.1%) was found in comparison to trematodes (18.3%) and cestode (Table 2, Figure 2).

Six species of helminth parasites were identified and of which four were nematode- *Haemonchus* sp. (62.3%), *Trichuris* sp. (56.3%), *Oesophagostomum* sp. (36.1%), *Bunostomum* sp. (27.9%). One species of trematode i.e., *Paramphistomum* sp. (18.3%), and one species of cestode i.e., *Moneizia* sp. (12.7%) were also found to be prevalent (Table 3, Figure 3).

The prevalence of these parasites across the three season were also recorded and it was found that the significant higher incidence was seen in rainy season (87.4%), followed by summer (67.7%) and winter season (50.4%) (Table 4, Figure 4). It is also evident from Table 5 and Figure 5, that younger goats are more prone to these parasites (87.5%) as compared to adults (51.3%) and the data (Table 6 and Figure 6) also revealed that the prevalence of these parasites is significantly more in females (74.2%) than males (59.6%).

Table 1: Overall prevalence of helminth parasites in goats

Total Number of intestines examined	Number of the infected intestines	% Prevalence
355	240	67.6

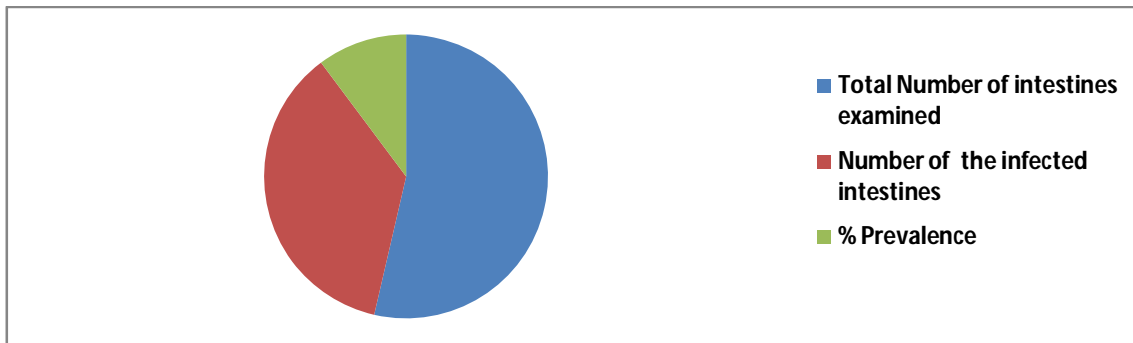


Figure 1: Overall prevalence of helminth parasites in goats

Table 2: Prevalence of different parasitic helminths in goats

Parasitic helminths	Total Number of intestines examined	Numberof the infected intestines	% Prevalence
Nematode	355	231	65.1
Trematode	355	65	18.3
Cestode	355	45	12.7
χ^2	269.835*		

*Significant at 0.05 level

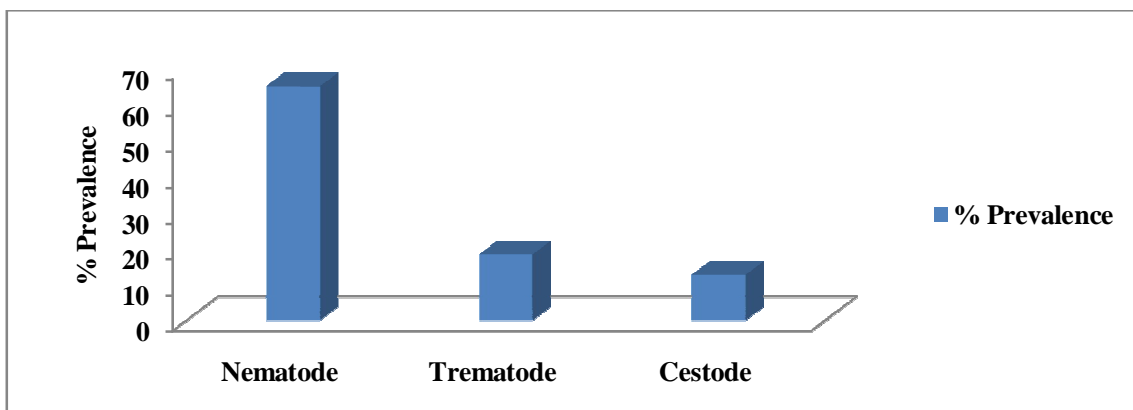


Figure 2: Prevalence of different parasitic helminths in goats

Table 3: Prevalence of different parasitic species in goats

Parasitic species	Total Number of intestines examined	Number of the infected intestines	% Prevalence
<i>Haemonchus</i> sp.	355	221	62.3
<i>Oesophagostomum</i> sp.	355	128	36.1
<i>Bunostomum</i> sp.	355	99	27.9
<i>Trichuris</i> sp.	355	200	56.3
<i>Paramphistomum</i> sp.	355	65	18.3
<i>Moneizia</i> sp.	355	45	12.7
X ²	313.551*		

*Significant at 0.05 level

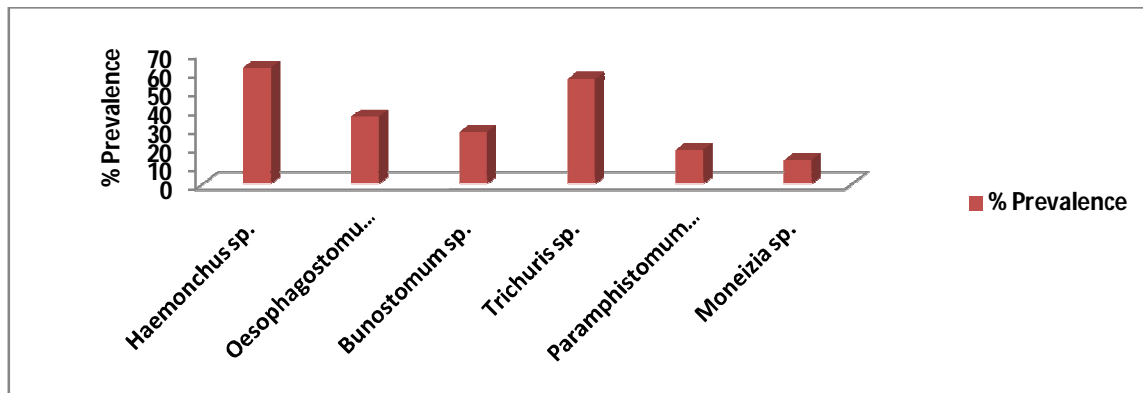


Figure 3: Prevalence of different parasitic species in goats

Table 4: Seasonal prevalence of helminth parasites in goats

Season	Total Number of intestines examined	Number of the infected intestines	% Prevalence
Winter	119	60	50.4
Summer	118	80	67.7
Monsoon	118	100	84.7
X ²	31.879*		

*Significant at 0.05 level

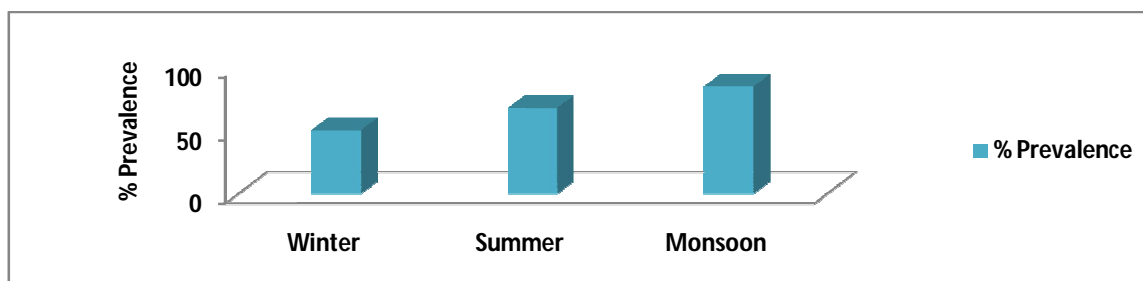


Figure 4: Seasonal prevalence of helminth parasites in goats

Table 5: Age -wise prevalence of helminths in goats

Age	Total Number of intestines examined	Number of the infected intestines	% Prevalence
Young (< 1year)	160	140	87.5
Adult (> 1 year)	195	100	51.3
X ²	52.641*		

*Significant at 0.05 level

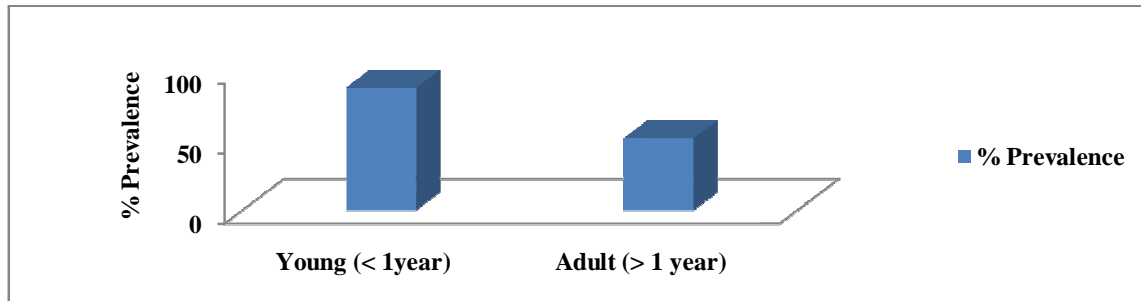


Figure 5: Age- wise prevalence of helminths in goats

Table 6: Gender -wise prevalence of helminths in goats

Gender	Total Number of intestines examined	Number of the infected intestines	% Prevalence
Female	194	144	74.2
Male	161	96	59.6
X ²	8.563*		

*Significant at 0.05 level

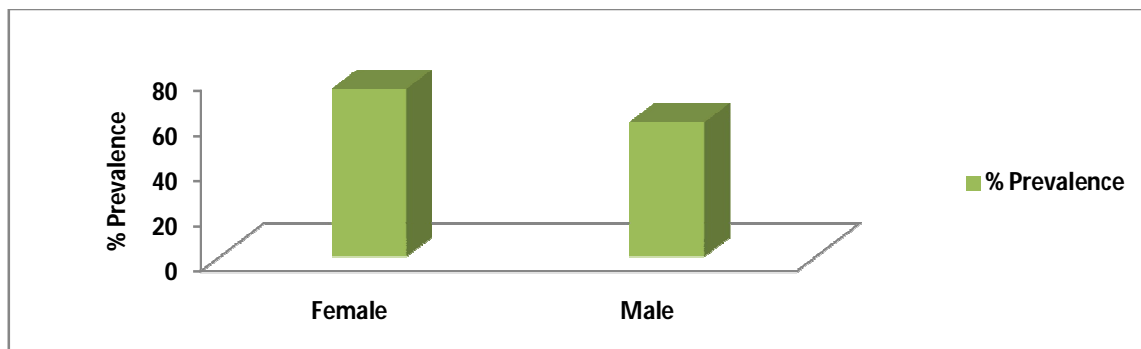


Figure 6: Gender -wise prevalence of helminths in goats

DISCUSSION

Investigations of causative factors influencing the prevalence rate of helminth infection revealed that the agro-climatic conditions and unhygienic pasture management was as vital factors responsible for determining the levels of infection. The results of the present study revealed 67.6% of the overall prevalence of gastrointestinal helminths and the finding are as per with the results of the study conducted by (Khajuria et al., 2013) who reported that 67.24% goats were infected with gastrointestinal helminths. Other studies also noted that 54.9% goats were infected with gastrointestinal helminth parasites (Patel et al., 2001), whereas 90.4% and 26% goats were infected with GI helminths, respectively (Ntonifor et al., 2013; Yimer and Birhan, 2016). Nevertheless, the

disparity between the present and previous reports might be due to the differences between the geographical conditions of the study area, the approach of the study and strains of the animal (Raza et al., 2012; Rashid et al., 2016). Infections due to different helminth parasites were also studied in the present research and the highest prevalence rate of nematode (65.1%) was reported, followed by trematode (18.3%) and cestode (12.7%). Similar findings were reported by (Izaz et al., 2008) who divulged the highest infection rate for nematode (42.67%) followed by trematode (16.67%) and cestode (4%) in a study conducted in Pakistan. A similar result was also given by (Tripathi and Subedi, 2015) where in the prevalence of nematode, trematode, and cestode in goats was found to be 65.3%, 22.2% and 11.1% respectively.

The higher prevalence of nematodes could be associated with the fact that this helminth has a relatively short life cycle. Moreover, this parasite is capable of developing resistance against modern synthetic drugs faster than any other helminth species (Radostits, 1994; Katoch et al., 1999). Some of the studies have also reported results in contradiction with the present research like, (Opera et al., 2005) has reported least prevalence of nematodes (8.7%) in comparison to trematodes (78.4%), and cestodes (13%); (Tambe et al., 2011) reported the highest prevalence of cestodes (48.33%), followed by nematode (26.66%) and trematode (10%). These variations in the prevalence of different types of helminths might be due to environmental factors such as temperature, humidity, and accessibility of intermediate hosts.

The present study also reported the most prevalent species, i.e., *Haemonchus* sp. (62.3%) followed by *Trichostrongylus* sp. (56.3%) and the results are in agreement with the study carried out by (Lone et al., 2012) where in the highest prevalence rate was recorded for *Haemonchus* sp. (82%) and *Trichostrongylus* sp. (74%) in Kashmir. Somehow, similar findings were also reported by (Raza et al., 2014) in a study conducted in Pakistan, where *Haemonchus* sp. has shown the highest prevalence (12.8%) followed by *Trichostrongylus* sp. (7.2%). In contrary, some researches i.e., a study conducted by (Tripathi and Subedi, 2015) recorded *Toxocara* sp. as the most prevalent species (16.66%) followed by *Fasciola* sp. (15.9%) in Nepal; (Rashid et al., 2016) reported the most prevalent species as *Trichostrongylus* sp. (21.8%) followed by *Haemonchus* sp. (10.9%) in Pakistan. This difference in the incidence of helminths could be due to the variation in geographical zone, ecological factors, availability of intermediate host and anthelmintic resistance species.

The seasonal prevalence of the gastrointestinal helminths was also studied in the present research and it was found to be highest in monsoon (84.7%), moderate in summer (67.7%) and lowest in winter (50.4%). The results are as per with the findings of (Pathak and Pal, 2008), who reported that Monsoon showed the highest prevalence rate (94.6%) followed, by summer (87.5%) and winter (63.2%). The highest prevalence rate in monsoon is due to the heavy rainfall, which provides appropriate molarity of salts in the soil and may be responsible for moulting (Soulsby, 1966). Besides, high temperature and rainfall lowers the immunity of the host and finally inclines it to a heavy infection. Lower the prevalence rate in winter could be related to reduced grazing hours of the animals, which helps in reducing the chances of contact between host and parasites (Katoch et al., 2000).

Further, the present study also disclosed that younger goats are more predisposed to higher infection as compared to their adults and this might be due to the less developed immune system (Sangvaranond et al., 2010). Moreover, the statement of (Knox, 2000) clearly justified the present research where he showed that adult animals can obtain immunity against gastrointestinal helminths through frequent encounter and by which they can expel the parasites before their establishment of infection. The results of this study disagree with the reports of some prior workers (Swarankar et al., 1996; Yadav et al., 2006; Chedje et al., 2006) who reported the highest level of parasitic infections had occurred in adult goats.

This study also revealed high prevalence of infection in female goats (74.2%) compared to their male counterparts (59.6%) the findings are in agreement with the result of (Odogu and Okaka, 2016; Sukupya and Rayamajhee, 2018) who reported females are more prone to helminth infection. This could be due to hormonal disturbance during estrous cycle and the pregnancy period, which brings stress in females, and further resulting in decreased immunity to infections (Urquhart et al., 1996).

Contrary results were reported in the studies conducted by some previous scientists (Raza et al., 2012; Olanike et al., 2015) who reported that male animals are more prone to infection as compared to females.

CONCLUSION

Prevailing agro-climatic circumstances, poor grazing management, and unhygienic grazing land provide more favorable conditions for the transmission of the helminth infestation into the host. The results show that nematode was the most prevalent helminths in the studied area surveyed and this could be due to the lower immunity of hosts as a result of malnourishment and poor sanitary management. Keeping in view of the results some control measure for preventing gastrointestinal helminth should be adopted to reduce the intensity of the infection in the affected area. In this concern, it is recommended that the practice of well-planned grazing of animals on hygienic land, organizing regular extension programs to educate rural farmers, conducting training programs for proper use of anthelmintics and other management practices should be adopted.

Conflict of Interest

The authors declare that they have no conflict of interest.

REFERENCES

1. Cerbo D., Manfredi A.R., M.T., Zanzani S. and Stradiotto K. (2010). Gastrointestinal infection in goat farm in Lombardy (Northern Italy): Analysis on community and spatial distribution of parasites. *Small Ruminant Research*, 88:102-112.
2. Hassan M.M., Hoque M.A., Islam S.K.M.A., Khan S.A., Roy K. and Banu Q. (2011). A prevalence of parasites in Black Bengal goats in Chittagong, Bangladesh. *International Journal of Livestock Production*, 2:40-44.
3. Anaeto M., Tayo G.O., Chioma G.O., Ajao A.O. and Peters T.A. (2009). Health and nutrition practices among smallholder sheep and goat farmers in Ogun State. *Livestock Research for Rural Development*, 21:11.
4. Odogu K.I. and Okaka C.E. (2016). Prevalence of gastrointestinal parasites of goats slaughtered at Aduwawaabattior, Benin city, Edo State, Nigeria. *International Journal of Innovative Agriculture and Biology Research*, 4: 22-26.
5. Junaidu U. and Adamu S.G. (1997). Survey of gastrointestinal helminth parasites of dogs of public health importance in Sokoto Metropolis". In *Proceedings of the 22nd Annual Conference of the Nigerian Society of Animal Production*, Abubakar Tafawa Balewa University Press.
6. Garedaghi Y., Rezaii-Saber A.P., Naghizadeh A. and Nazeri M. (2011). Survey on prevalence of sheep and goats lungworms in Tabriz abattoir, Iran. *Advances Environmental Biology*, 5: 773-775.
7. Mohanta U.K., Anisuzzaman T., Das P.M., Majumder S. and Mondal M.M.H. (2007): Prevalence, population dynamics and pathological effects of intestinal helminths in Black Bengal goats. *Bangladesh Journal of Veterinary Medicine*, 5: 63-69.
8. Zeryehun T. (2012). Helminthosis of sheep and goats in and around Haramaya, southeastern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 4: 48-55.
9. Raza M.A., Iqbal Z., Jabbar A. and Yaseen M. (2007). Point prevalence of gastrointestinal helminthiasis in ruminants in southern Punjab. *Pakistan Journal of Helminthology*, 81: 323-328.
10. Khan M.K., Sajid M.S., Khan M.N., Iqbal Z. and Iqbal M.U. (2009). Bovine fasciolosis: prevalence, effects of treatment on productivity and cost benefit analysis in five districts of Punjab, Pakistan. *Research in Veterinary Science*, 87: 70-75.
11. Perry B.D., Randolph R.F., McDmot J.J., Sones K.R. and Thomson P.K. (2002). Investigating in animal health research to alleviate poverty. *International Livestock Research Institute*, Nairobi, Kenya: 148.

12. Gupta R.P., Yadav C.L. and Chaudhri S.S. (1987). Epidemiology of gastrointestinal nematodes of sheep and goats in Haryana, India. *Veterinary Parasitology*, 24: 117 – 127.
13. Saha S.B., Pramanik S. and Mukherjee G.S.(1996). Prevalence of gastrointestinal nematodes of goats in West Bengal. *Indian Journal of Animal Science*, 11: 51–52.
14. Katoch R., Chauhan P.P.S. and Johri D.K.(2000). Seasonal incidence of gastrointestinal nematodes in goats of Mathura region. *Indian Veterinary Journal*, 77: 259-260.
15. Rahman N. and Ali A. (2001). Monthwise prevalence of gastrointestinal trematodes, cestodes and nematodes infecting Damani sheep and goats in District D.I.Khan. *Pakistan Veterinary Journal*, 21: 111-113.
16. Mamatha G.S. and Placid E.D. (2007). Gastrointestinal parasitism in sheep and goats from different districts of Karnataka. *IntasPolivet*, 8: 112-114.
17. Raza M.A., Younas M. and Schlecht E. (2014). Prevalence of gastrointestinal helminths in pastoral sheep and goat flocks in the Cholistan desert of Pakistan. *The Journal of Animal & Plant Sciences*, 24: 127-134.
18. Waller P.J. (2006). From discovery to development: Current industry perspectives for the development of novel method of helminth control in livestock. *Veterinary Parasitology*, 139: 1–14.
19. Cable R.M. (1957). An illustrated laboratory manual of parasitology. 4thedn., Burges Publishing Co., Minneapolis 15, Minnesota, USA.
20. Hansen J. and Perry B.(1993) *The Epidemiology, Diagnosis and Control of Helminth parasites of Ruminants*. Published by the International Laboratory for Research on Animal Diseases, Nairobi, Kenya.
21. Meyer M.C. and Olsen O.W. (1975): *Essentials of Parasitology*. 2ndedn., v.m. c. Brown Co. Iowa. 303 pp.
22. Soulsby E.J.L. (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals*. 7thedn., English Language Book Society and BailliereTindall, London.
23. Khajuria J.K., Katoch R., Yadav A., Godara R., Gupta S.K. and Singh A.(2013). Seasonal prevalence of gastrointestinal helminths in sheep and goats of middle agro-climatic zone of Jammu province. *Journal Parasitic Disease*, 37: 21–25.
24. Patel M.D., Nauriyal D.S., Hasnani J.J. and Gupta R.S. (2001). Prevalence of gastrointestinal parasitism in goats maintained under semi-intensive and field management systems. *Indian Journal of Veterinary Medicine*, 21: 99-101.
25. Ntonfor H.N., Shei S.J., Ndaleh N.W. and Mbunkur G.N. (2013). Epidemiological studies of gastrointestinal parasitic infections in ruminants in Jakiri, Bui Division, North West Region of Cameroon. *Journal of Veterinary Medicine and Animal Health*, 5: 344-352.
26. Yimer A. and Birhan E. (2016). Prevalence and identification of gastrointestinal nematodes of small ruminants in northern Ethiopia, Middle-East. *Journal of Scientific Research*, 24: 2602-2608.
27. Raza M.A., Arshad H.M., Ayaz M.M., Murtaza S., Bachaya H.A., and Basit A. (2012). Gastrointestinal helminthiasis in goats at the localities of Jatoi, Punjab, Pakistan. *Science International (Lahore)*, 24:171-175.
28. Rashid A., Khattak M.N.K., Khan M.F., Ayaz S. and Rehman A.U. (2016). Gastrointestinal helminthoses: prevalence and associated risk factors in small ruminants of District Kohat, Pakistan. *The Journal of Animal and Plant Sciences*, 26: 956-962.
29. Ijaz M., Khan M.S., Avanis M., Asharf K., Ali M.M. and Saima (2008). Infection Rate and chemotherapy of various Helminths in goats in and around Lahore. *Pakistan Veterinary Journal*, 28:167-170.
30. Tripathi R.P. and Subedi J.R. (2015). Seasonal prevalence of gastro-intestinal helminth parasites of goats (*Capra* sp.) of Shivraj municipality-13 Kapilvastu, Nepal. *Nepalese Journal of Zoology*, 3: 63-67.
31. Radostits O.M., Blood D.C. and Gay C.C. (1994). Diseases caused by helminth parasites: A text book of diseases of cattle, sheep, pigs, goats and horses. 8thedn., London, BailliereTindall. *Veterinary medicine*: 1223–1230.
32. Katoch R., Mandial R.K. and Nagal K.B. (1999). Outbreak of *Haemonchus contortus* infection in sheep of Himachal Pradesh. *Indian Veterinary Journal*, 76: 932–933.

33. Opera M.N., Nwaobasi, J.K. and Okoli I.C. (2005). Occurrence of parasitic helminth among small ruminants reared under traditional husbandary system in Owerri, South east Nigeria. *Bulletin of animal health and production in Africa*, 53: 226-233.
34. Tambe D.S., Wankhede H.J. and Dhole J.S. (2011). Prevalence of helminthic infection in *Capra hircus* L. From Ahmednagar District (M.S.). *Recent Research in Science and Technology*, 3: 37-39.
35. Lone B.A., Chishti M.Z., Ahmad F. and Tak H. (2012). A survey of gastrointestinal helminth parasites of slaughtered sheep and goats in Ganderbal, Kashmir. *Global Veterinaria*, 8: 338-341.
36. Pathak A.K. and Pal S. (2008): Seasonal prevalence of gastrointestinal parasites in goats from durg District of Chhattisgarh. *Veterinary World*, 1:136-137.
37. Soulsby E.J.L. (1966). *Biology of parasites*. Academic press, New York and London : 185-196.
38. Hawkins P.A. (1945). Studies of sheep parasites VI. Observations on weather in relation to untreated nematode infections. *Journal of Parasitology* , 31:17.
39. Sangvaranond A., Natipong L. and Wongdackajorn D. (2010). Prevalence of helminth parasites and intestinal parasitic protozoa among meat goats raised in private farms in Saraburi province Thailand. *Journal of KasetsartVeterinarians* , 20: 85-95.
40. Knox D.P. (2000). Development of vaccines against gastrointestinal nematodes. *Parasitology* 2000, 120: 543-561.
41. Swarankar C.P., Singh D., Srivastava C.P., Bhagwan P.S.K. and Dimri U. (1996). A retrospective study on ovine gastrointestinal helminthiosis under semi-arid conditions. *Journal of Veterinary Parasitology* , 10:15-21.
42. Yadav A., Khajuria J.K. and Raina A.K. (2006). Seasonal prevalence of gastrointestinal parasites in sheep and goats of Jammu. *Journal of Veterinary Parasitology* , 20: 65-68.
43. Chedge R., Dixit A.K., and Dixit P.(2006). Prevalence of gastrointestinal parasites in goats at Adhartal, Jabalpur. *Research gate*, 2: 155-156.
44. Sukupayo P. and Rayamajhee B. (2018). Prevalence of intestinal helminth parasites in goats of Roshi rural municipality-11, NEPAL. *International Journal of Scientific & Engineering Research* , 9: 1471-1475.
45. Urquhart G.M., Armour J., Dunnican J.L. and Jennings F.W. (1996). *Veterinary Parasitology*. 1stedn., ELBS, Longman, London, UK.
46. Olanike AO, Olayide AJ, Oludunsin FO, Racheal AO, Japhet DW (2015). Prevalence of gastrointestinal parasites of goats in Ibadan, Southwest, Nigeria. *World Journal of Agricultural Research*, 3: 49-51.