PREVALENCE AND EPIDEMIOLOGY OF GASTROINTESTINAL HELMINTHS IN DAIRY COWS IN "BATHAN" AREAS OF BANGLADESH

A Thesis

By

AKASH SAMADDER

DEPARTMENT OF MICROBIOLOGY AND PARASITOLOGY

SHER-E-BANGLA AGRICULTURAL UNIVERSITY
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By

AKASH SAMADDER

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Approved By

Prof. Dr. Uday Kumar Mohanta
Supervisor
Department of Microbiology and Parasitology
Sher-e-Bangla Agricultural University

DR. Shamarendra Narayan
Co-Supervisor &
Deputy Manager
Potiya Dairy Plant, Chattogram
Bangladesh Milk Producers Co-operative Union Limited (Milk Vita)

DR. Md. Kamrul Hassan
Associate Professor &
Chairman, Examination committee

Department of Microbiology and Parasitology
Sher-e-Bangla Agricultural University

DEPARTMENT OF MICROBIOLOGY AND PARASITOLOGY

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka – 1207

CERTIFICATE

*This is to certify that the thesis entitled "**PREVALENCE AND POPULATION DYNAMICS OF GI HELMINTH IN DAIRY COWS IN "BATHAN" AREAS OF BANGLADESH**" submitted to the Faculty of Animal Science & Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Microbiology and Parasitology**, embodies the result of a piece of bona fide research work carried out by **Akash Samadder**, Registration No. **13-05309** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Prof. Dr. Uday Kumar Mohanta

Dated: ***Supervisor***

Department of Microbiology and

Place: Dhaka, Bangladesh *Parasitology*

Sher-e-Bangla Agricultural University

DEDICATED TO

My Beloved Parents

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The Author

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ACRONYMS AND ABBREVIATIONS

ABBREVIATIONS	FULL WORDS
DLS	=Department of Livestock
BBS	=Bureau of Statistics
GDP	=Gross Domestic Product

Prevalence and population dynamics of Gastrointestinal Helminth in dairy cows in "Bathan" areas of Bangladesh

ABSTRACT

A one year (2018-19) prevalence study on gastrointestinal helminth was conducted in Bathan areas (Pabna and Sirajgonj districts) of Bangladesh. The study was conducted between September,2018 to August,2019. A total of 144 samples were taken from both indigenous and crossbred cattle from 5 selected upazillas of two districts. Qualitative examination were done by a series of routine coproscopical methods including direct smear technique, sedimentation technique, centrifugal technique and floatation technique as qualitative methods and Mcmaster method of egg counting as quantitative technique. The effects of topography, season, age and gender were tested in both crossbred and local cattle. Over all prevalence was found 81.94%. Multiple infections were found in 32.2% cases. The prevalence was highest in the rainy season(85.71%) followed by summer season (81.63%) and winter season (79.24%).Total six types of helminth were listed, out of which two were trematodes and four were nematodes. Higher amount of prevalence was recorded in older cattle (85.33%) than younger catlle (78.26%).Overall prevalence of *Fascilola* spp. was (27.08%), which was highest in the study followed by *Paramphistomum* spp.(20.13%), *Strongyle* spp.(20.13%), *Haemonchus* spp.*(*13.88%). Average EPG found in the whole study was 211.65 which was highest in rainy 259.11 followed by summer (225.11) and winter (158.18). It can be concluded that a favorable humid condition during rainy season favors the growth of propagation of developmental stages which would be the reason of peak prevalence. Further studies can be helpful to find out the actual causes of parasitism and to develop measures against it.

CHAPTER 1

INTRODUCTION

Helminth includes four classes of worms, namely cestoda (tapeworms) and trematoda (flukes and blood flukes), many species of nematodes (roundworms) and thorny headed worms (*Acantocephala).* Gastrointestinal parasitism is a world-wide problem. It is thought to be one of the major constraints that hinder the development of livestock population (Kakar *et al.,* 2008) and also adversely affects the health and productivity of animals (Radostits *et al*., 1994). The losses caused by parasitic infections are in the form of lowered general health condition, retarded growth rate, diminishing the working efficiency, decreased milk and meat production, abortion, cost associated with preventive measures and reduces the disease resistance capability, which may ultimately lead to higher mortality (Silvestre *et al.,* 2000; Radostits *et al.,* 1994).

Bangladesh is an agricultural based country with a high population. Livestock in Bangladesh is an essential component of crop cultivation and post-harvest operations. The livestock is considered to be the back bone of agriculture of Bangladesh (Anon, 1985) especially for the draft power. There is a lot of demand for the livestock products and by-products throughout the country. Domesticated ruminants in Bangladesh are at continuous risk of infection with one or more harmful helminths and the extent of financial losses is estimated between 25 and 30 million sterling pounds annually (Rahman, 1999). The geo-climatic conditions together with the water logged and low-lying areas in Bangladesh are conducive to parasitic diseases in domestic ruminants (Durrani, 1965).

Contaminations brought about by gastrointestinal parasites are perhaps the most hazardous wellbeing concerns for cattle all around the world specially water lying lands like “Bathan” area. These parasites may cause a wide range of health problems ranging

from subclinical disease to actual death. Animals infected with parasites usually respond to sickness with predictable pattern of behavioral changes. Numerous types of gastrointestinal parasites are shed to the climate through mammalian excrement and communicated to the creature during grazing. The surrounding herbage is therefore regularly contaminated with infective third stage larvae (Hutchings *et al.,* 2003). In fact, cattle of Bangladesh are affected by various types of helminth (Rahman and Razzak, 1973; Rahman and Mondal, 1983). The losses due to parasitism take in the form of mortality, poor general health condition, retarded growth, lower output of work, decrease in the production of milk and meat (Faiz,1972). ADB report (1984) clearly mentioned that the loss of productivity of animals in terms of mortality, milk, meat, generation loss and other productive traits due to parasitism (50%) in Bangladesh The effects of internal parasites on cattle will vary with the severity of infection as well as age and stress level of the animal. In general, younger animals and animals under stress are most likely to show signs of parasitism. Mature cows acquire a degree of immunity to parasites that reside in the lower gastrointestinal tract. Cows, especially dairy, in early lactation are often in a negative energy balance due to the stress of lactation. These cattle are affected more than cows in later lactation, when smaller levels of milk are being produced.

Fasciolosis in cattle mainly manifests as a subclinical chronic disease, associated with hepatic damage and blood loss caused by parasites in the bile duct (Kaplan,2001). Cattle are less susceptible to showing clinical signs of fasciolosis compared to small ruminants, with a higher infection challenge of metacercariae required to cause clinical disease (Dargie,1987).Rumen and reticulum of sheep, goats, cattle and water buffaloes are mainly affected by adult paramphistomes (Sanabria *et al.,* 2008). The harm caused by this infection in bovine affects production, since these parasites provoke a lower nutritious conversion, a loss of weight and/or a decrease in milk production, which cause economic losses. The large intestine and occasionally the distal small intestine is effected by *Oesophagostomum* spp. which causes nodule worm disease. Larvae penetrate the large-

intestinal mucosa but occasionally move into the deeper areas of the intestinal wall near the serosa. The resultant inflammatory reaction may lead to the formation of a caseous nodule that may mineralize over time. *Strongyle papillosus* is particularly harmful for calves of up to 6 months of age. The lungs are strongly harmed by migrating larvae, which can also cause secondary infections with bacteria. This results strong coughing, difficult breathing, fever and even pneumonia. In all livestock larvae can also substantially harm the gut's wall**,** causing serious inflammations (enteritis) and diarrhea (sometimes hemorrhagic), loss of appetite, strong weight losses and even death after massive infections.

Nearly half of the total milk production in Bangladesh is produced in northern areas of Bangladesh, especially in the "Bathan" areas of Bangladesh (Pabna and Sirajgonj district). Starting from a much low level daily output of local cows have increased upto 22% by the year 1996 to 2002 (Hemme *et al.*, 2003). Bangladesh Milk Producers' Co-operative Union Limited (BMPCUL), which commonly known as Milk Vita is situated here. Chillng plants of different organizations like Arong, Akij, Pran, Tatka, Quality milk, Aftab etc also collect milk from this reason. Most of the cattle in this area are cross bred. Unfortunately, there is no much inclusive research report on helminhiasis in these areas. Therefore, this study may contribute much towards the control of helminth infection in *"Bathan"* areas, and thereby may promote higher milk production. Therefore the present study was undertaken to study the prevalence of gastrointestinal helminth in cattle at different areas of Pabna and Sirajgonj.

The farmers usually rear their cattle under traditional husbandry practices. Nutritional status of the animas in general is not satisfactory as they are over-worked but under-fed or half-fed, which makes the animal susceptibile to diseases including different parasitic diseases. About 50% calves until 1-year of age die due to gastrointestinal parasites.

Besides, adult cattle are severely affected by parasitism resulting enormous economic losses in Bangladesh (Sardar *et al.,* 2006). . Unfortunately, in Bangladesh these problems are neglected or overlooked sometimes as the animals show little or no clinical signs after infected with parasites (Raza *et al.,* 2010; Alim *et al.,* 2011).

OBJECTIVES

- To determine the helminth infection through coprological examination.
- To learn prevalence and epidemiology of helminths.
- To elucidate the prevalence and epidemiology of helminths.

CHAPTER 2

REVIEW OF LITERATURE

Many scientists from all over the world paid their keen interest towards advancement of sheep farming and its management due to its high food and market value. However, attempts have been made to explore all the literature to focus on the progress of science regarding sheep farming and its disease management. Parasites and pathogens represent an increasing threat to natural populations (Harvell *et al.*, 1999); and (Daszak *et al.*, 2000). Recently, attention has been focused on examining methods by which disease threats can be managed in free ranging animal and wildlife.

2.1. Global context

In Netherlands (Borgsteede *et al*. (2000) collected fecal samples for examination of nematode infections in dairy cows. From 113 animals, 88.5% had nematode eggs in their faeces.

Campos *et al.* (1990) from Mexico stated that 213 of 328 cows examined, and 135 of 209 calves sampled, were shedding nematode eggs. The larvae identified were: *Cooperia* spp. *Oestertagia* spp. *Haemonchus spp*, *Oesophagostomum* spp. *Trichostrongylus* spp. and *strongyloides papillosus.*

A study in Ethiopia Habtemichael *et al. (*2018), revealed that of the 300 cattle examined, 42.33% were positive for gastrointestinal helminth egg presence. Eggs from five genera, with two nematodes (*Strongyle* and *Toxocara*); two trematodes (*Paramphistomum* and *Fasciola*) and one cestode (*Monezia*) were identified.

Two separate studies were performed by Agneessens *et al.* (1997) in Belgium. They recorded *Oestertagia oestertagi* eggs to be the predominant species shed by cows and calves in the first study. However, calves showed low egg counts through the grazing season. In the second study, *Cooperia onchopora* was the predominant species in calves which were excreting high egg counts. In the cows, *Oestertagia ostertagia, Oesophagostomum, C. onchophora* and *Trichostrongylus axei* were present. It was suggested that, in the first study, the cows were the major source of pasture contamination, while in the second study the winter-born calves, being older and having a higher herbage intake, became responsible for the high Cooperia pasture infestation level at housing.

A survey in Ghana by Agyei (1997) showed that the number of infective larvae on pasture was high during the rainy season and soon after, and low or none in the absence of rainfall. The number of infective larvae on pasture was also influenced by the number of rain-days in the period.

Awash *et al.* (2011) performed a study on small scale dairy farms in the Jimmah town, Ethiopia and recorded 163 positive samples out of 210 showing prevalence of 77.6%. The most prevalent gastrointestinal helminth parasite eggs detected were Paramphistomum (48.6%), Strongylidae (32.4%), Fasciola (23.3%), Moniezia (5.2%), Strongyloid (3.3%), Toxocara vitulorum (2.4%), Trichuris (1.9%), Capillaria (1.4%) and Nematodirus (0.9%) in decreasing order. The overall infection rates for nematode, cestode, trematode and mixed infections were 42.3%, 5.2 %, 71.9% and 19.7, respectively. The overall prevalence of gasterointestinal helminth infection was high in October (81.3%) and low in February (52.4%).

A total of 12 nematode species were determined in the collection recovered from domestic ruminant in Afghanistan. Ten of them were found for the first time in this region: *Trichocephhalus globulosus, Trichostrongylus probolurus, Cooperia bisonis, Nematodirus* spathiger, *N. abnormalis, Thelazia rhodesi*, *Bunostomum phlebotomum, Haemonchus contortus, Dictyocaulus filaria and Oesophagostomum radiatum* (Barus *et al.,* 1976). At the same time Kotrla *et al.* (1976) recorded seven trematode species in the bile duct and rumen of domestic ruminants: *Fasciola gigantica, F. hepatica, Gigantocotyle explanatum, G. siemense, Paramphistomum epiclitum, Fischoederius cobboldi and Gastrothylax cruminifer.*

A total of 1413 faecal samples of cattle and buffaloes were examined by Gupta *et al. (2012),* in Jablpur , Madhya Pradesh of which 68.93% were found positive for various gastrointestinal parasites. The prevalence was found higher in buffaloes (73%) as compared to cattle (65%). In cattle, strongyle infection (43%) was most prevalent followed by coccidia (24.25%), amphistomes (17.59%), Trichuris sp. (5.96%), Fasciola gigantica (0.99%), Toxocara sp. (0.43%), Strongyle sp.(0.28%) and Moniezia sp. (0.28%).

A study was conducted by Abbas *et. al.* (2016), from March 2015 to February 2016 in different zones of Tehsil Chakwal, Pakistan in different breeds of cattle to detect the prevalence of gastrointestinal parasites. A total of the 1039 faecal samples were randomly collected from cattle in the study area and standard laboratory procedures were followed to determine the prevalence of gastrointestinal parasites. The study revealed that the overall prevalence of gastrointestinal parasites of cattle was 58.13% with maximum prevalence for trematodes (21.56%) following 18.48% for nematodes and 18.09% for cestodes.

A study was undertaken by Krishna Murthy *et al.(2016),* to know the prevalence of gastrointestinal parasites of cattle and buffaloes in Bangalore, Karnataka. An overall prevalence of gastrointestinal parasites among cattle (75.2 %) and buffalos (76.8 %) was determined by coprological examination. The gastrointestinal parasites detected in cattle and buffalo were *Strongyle* (39.8 and 29.1 %), followed by Amphistome (24.4 and 23.1 %), *Moniezia* spp. (5.3 and 5.9 %), *Fasciola* spp. (4.1 and 15.6 %), Trichuris spp. (1.4 and 2.9 %), *Buxtonella* spp. (36.6 and 37.3 %) and *Eimeria* spp. (26.7 and 29.8 %) respectively.

A study in Gujarat, India, performed by Hirani *et al.(*1999), on cattle and buffalo revealed that 38.86% were positive for gastrointestinal parasites. The predominant infections were of amphistomes (21.5%), coccidia (7.86%) and strongylid (7.53%). Fasciola (2.58%), Trichuris (0.97%) and Moniezia (0.11%) were also present. Significant increase in amphistomes and coccidia were observed from December to June and August to March, respectively; whereas with Strongylid significant increases were observed from September to October and January to March.

A total of 2339 fecal samples of cattle were examined by Das *et al.(*2019*)* in Guwahati, Assam. Overall prevalence of infection was 58.35%. *Strongyle* sp. (18.76%) was predominant followed by *Eimeria sp*. (11.97%), Amphistome sp. (8.72%), *Strongyloides* sp. (3.76%), *Moniezia* sp. (2.65%), *Toxocara vitulorum* (1.32%), *Buxtonella sulcata* (0.81%), *Trichuris* sp. (0.72%), *Fasciola gigantica* (0.47%) and *Bunostomum* sp. (0.38%). Mean EPG in cross-bred and non-descript cattle was 617.60±11.81 and 550.44±11.05, respectively. Maximum EPG in cross-bred (842.00±32.90) and non-descript (740.79±34.48) cattle were recorded in the month of August, respectively.

2.2. National Context

A study on Prevalence of gastrointestinal parasites in cattle at Vangura upazila in Pabna district of Bangladesh says that among 170 fecal samples examined, 133 (78.24%) were found positive for parasitic infections and mean egg per gram of feces (EPG) was 403.01±31.82 (Md. Rafiqul Islam *et al., 2012*). The parasites identified on fecal examinations were snail borne trematodes namely, *Fasciola gigantica* (4.11%), amphistomes (40%), *Schistosoma* spp. (5%), nematodes namely, *Haemonchus* sp. (3.52%), Strongyles (1.17%), *Trichuris* sp. (1.76%), *Dictyocaulus* sp. (0.58%) and cestodes *Moniezia* spp. (3.52%), and protozoal infections namely, *Balantidium* coli (41.76%) and *Eimeria* spp. (4.11%).

A study was conducted to evaluate the zoonotic gastrointestinal parasitic infections in cattle at Sirajganj district of Bangladesh during the period from February, 2016 to November, 2016 by (Kabir *et al., 2016).* It shows that In this study, 16.66% infection with *Fasciola gigantica*, 4.66% cases with *Trichostrongylus axei*, 6% infection with *Schistosoma indicum*, 3.33% infection with *Trichuris* spp, 2.6% infection with *Strongyle sp. papillosus*, 4% infection with *Giardia* spp. and 7.33% infection with *Balantidium coli* were recorded.

Mondal *et al. (*2000) recorded that in Bangladesh slaughtered tracer animals (cow calves and goats) which were released for 1 month in grassland and identified six species of nematodes: *Haemonchus contortus, Trichostrongylus axei, Mecistocirrus digitatus, Oesophagostomum* spp., *Trichuris spp. and Bunostomum* spp. and one cestode (*Moniezia spp.).* This preliminary study suggests that grasslands are one of the main sources of gastrointestinal parasitic diseases of livestock in Bangladesh.

A one year (2009-10) prevalence study on gastrointestinal parasitism was conducted in crossbred and local cattle, Chittagong and the result shows that the overall prevalence of gastrointestinal parasitic infections was 39.75% and 46.25% in crossbred and local cattle, respectively (Alim *et al*.,2009). Significantly higher prevalence of *Paramphistomum* spp (20.13%) was found in rainy season whereas *Haemonchus* spp. (5.56%) and *Moniezia* spp. (4.16%) were higher in summer.

A group of researchers of Sylhet Agricultural University (N. Alim M. A Ilyas, M.M. Hossain, M.J.U. Bhuyan and M.M.H. Khan) shows that Out of 5400 fecal samples 4075 animals were found to be positive with various GI nematodes infection contributing a prevalence rate of 75.46%. The samples were collected from different regions of Bangladesh. The results revealed seven groups of nematodes were prevalent during the study period including *strongylid* spp. (65.87%), Trichuris spp. (8.76%), *Staphanofilaria*s spp. (5.70%), *Capillaria* spp. (5.25%), *Strongyle sp.* spp. (5.15%), *Thelazia* spp. (5.08%) and *Ascaris spp.* (4.32%).

Kabir *et al.* (2018), performed cross-sectional study to establish the prevalence and intensity of gastrointestinal parasites of cattle from Sher-e-bangla nagar area, Dhaka (kabir *et al.,* 2018,) on fecal sample of 109 cattle showed a prevalence (41.2%) of parasite infections. Out of this percentage, 19.2% had multiple parasites while 13.8% had a single parasite infection and mean egg per gram of feces (EPG) was 516.4±222.6. The parasites identified on fecal examinations, Amphistomes (22.9%) was highest followed by *Eimeria* spp. (11.9%), *Fasciola gigantica* (10.1%), *Oesophagostomum* spp. (8.2%), *Ostertagia* spp. (6.4%), *Moniezia benedini* (5.5%), *Cooperia* spp. (4.6%) and *Capillaria* spp. (3.7%).

A study of two months was conducted in cattle on by Hassan *et. al.(*2017*)* gastrointestinal parasitism of Chandanaish Upazilla, Chittagong, Bangladesh which revealed that out of 50 samples, the overall prevalence of gastrointestinal parasitic infestation was 64%. Among different gastrointestinal parasitic infections, the prevalence of *Paramphistomum* spp. infection was the highest (22%) followed by *Toxocara* spp. infection (12%) and the lowest prevalence was recorded in case of *Trichostrongylus* spp. (2%).

CHAPTER 3

MATERIALS AND METHODS

3.1. Study area

To determine the prevalence of gastro-intestinal nematodes infection in dairy cattle, data were collected from three Upazillas (Raigonj, Chowhali and Shahjadpur) of Sirajgonj districts and two upazillas (Bera, Sathia) of Pabna.

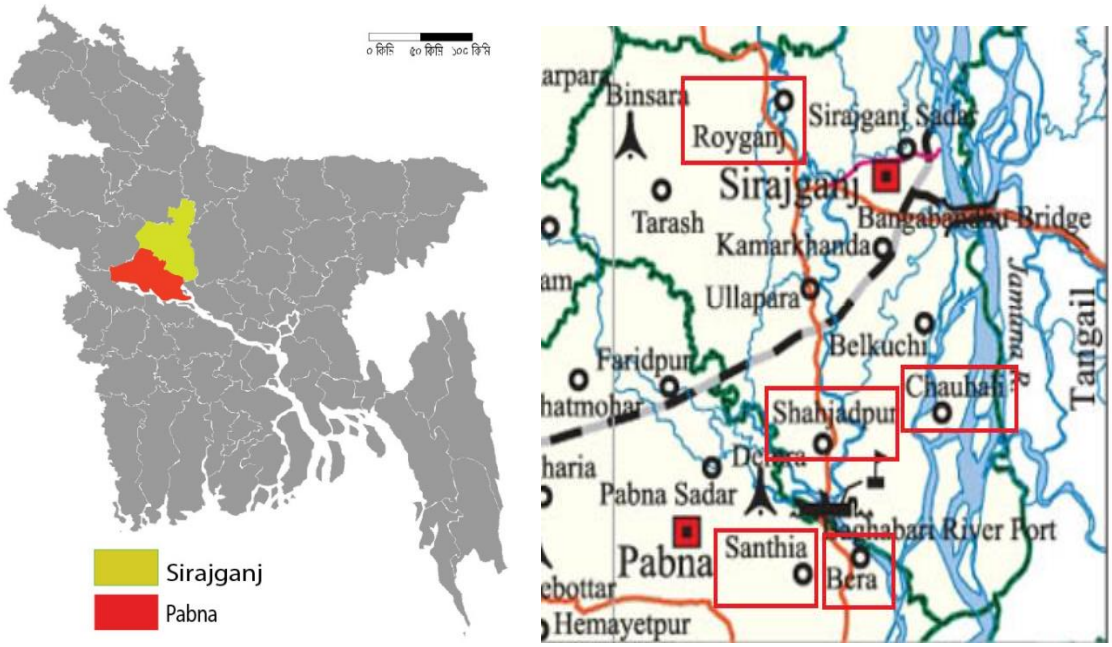


Figure 1: Study area

3.2. Geographical and climatic condition of the Study area

The study was conducted in Bathan areas of Bangladesh those are located in Sirajgonj and Pabna. The latitude and longitude of Pabna is 24.006355N and 89.249298E respectively. Sirajganj District is located in between 24.452646N and 89.681621E. There are hectors of grazing yards for herbivores. This area is intersected by rivers of varying magnitude. The river system, though, is constituted by the Padma and the Jamuna with their interlacing offshoots and tributaries. Besides these flowing streams, the interior has the abandoned beds of old rivers, most of which remain dry except in rainy season. The

general trend of the drainage of the Sirajganj subdivision is from north-west to south-east, with the rivers entering it from the north-west flow into the Jamuna after a tortuous course. Rivers those follow through the bathan areas are the Padma, the Baral, the Ichamoti etc. In the rainy season (June-August) bathan area goes under water and farmers takes their Cattle back in households. The climatic conditions of the selected study areas were more or less similar to the average condition of the country. The climate of Pabna district is moderate in nature. Highest temperature is 36.7°C in April and 12.9°C in December. Average precipitation is 101.7 mm which is highest (360mm) in June. Average humidity is 77%.

3.3. Period of study

The study was conducted between September, 2018 to July, 2019 which covers all three main seasons of Bangladesh. Samples were taken between September, 2018 to August,2019 which covers all three seasons (rainy, summer and winter) Bangladesh. In winter and summer season sample were collected from Bathans area while in rainy season, the samples were collected from the households.

3.4. Fecal sample collection & Preservation

Fecal samples were collected from 144 cattle randomly. The samples were collected directly from rectum or from the pasture just after defecation. About 10-15 grams of feces were collected from each animal in plastic container. Samples were preserved in 10% formalin and marked individually. Information on age, weight, anthelmintic treatment history etc. was noted after talking with the owners. Fecal samples were transported to the laboratory and kept refrigerated at 4°C until processed for further examination.

Figure 2: Collection of fecal sample

Figure 3: Cattle shed

3.5. Microscopic examinations

For the confirmation of the infection, fecal samples were subjected to both the qualitative and quantitative examinations in the laboratory within 1-2 weeks of collection.

3.5.1. Qualitative methods

3.5.1.1. Direct fecal smear Technique

At first a drop of saline was placed on a clean glass slide. Very small amount of fecal sample was collected by using toothpick. A very thin smear was made on a clean slide and covered by a cover slip. Finally the slide was examined under microscope at low magnification (X10)

3.5.1.2. Sedimentation Technique

5-10g of fecal sample was taken in a beaker to which 50ml water was added. The sample was mixed properly and then the sample was filtered using a tea strainer and the filtered sample was poured in a plastic test tube and allowed to sediment for 5 minutes. The tube was taken out and the supernatant was removed with the help of a dropper. A drop of the sediment was taken on the slide, and finally examined under microscope at 10x or 40x.

3.5.1.3. Centrifugation Technique

At first 2-5 grams of fecal sample was taken in 10-12 ml water followed by straining in a beaker with a tea strainer. Then the filtrate was taken in a centrifuge tube. Centrifuge was done for 5-6 minute at 2000 rpm. The supernatant was then poured off. Some drops were transferred to a microscopic slide by touching a clean wire loop to the surface of the fluid. Then Cover slip was placed and examination was done under 10 X objective.

3.5.1.4. Floatation technique

Floatation fluid was made by mixing 400 g of Sodium Chloride into 1000 ml of water. Thus flotation fluid was prepared with a specific gravity between 1.18 to 1.20. Two or five grams of feces was taken and mixed with 10ml of saturated salt solution. This solution was poured in a cup through the tea strainer. This solution was then taken in to 12- 15 ml centrifugal tube and tube was filled with saturated salt solution about 1 inch from the top of the tube. Centrifugation was done for 5 minutes at 1200 rpm. The test tube was then removed from the centrifuge and 1 inch was filled with sugar solution. A coverslip was placed on the test tube and it was allowed to stand for 10 minutes. After that the coverslip was removed and observed under the microscope at 10X to 40X.

3.5.2. Quantitative methods

3.5.2.1. Mcmaster method of egg counting

McMaster technique uses a counting chamber which enables a known volume of fecal suspension (2 x 0.15 ml) to be examined microscopically. At first two gm of feces is taken in beaker and then 28 gms of floatation fluid is added followed by mixing with spatula. Then the mixture is passed into another beaker through tea strainer. Then 2 compartments of McMaster counting slide is filled with sub sample by a Pasteur pipette. The counting chamber is then allowed to stand for 5 minutes so that the eggs float to the surface and the debris go to the bottom of the chamber. Magnification should be done in 10X magnification. Then eggs are counted and when counting was done the Mcmaster counting chamber was removed followed by washing.

CHAPTER 4

RESULT & DISCUSSION

4.1. Overall findings:

The study was conducted between September,2018 to July,2019 covering all three predominant seasons of Bangladesh. A total of 144 samples were collected and out of them 118 cases were found positive which show a prevalence of 81.94%. This finding is almost similar to the earlier finding of Saifuzzaman (1996) who found prevalence of 86.19% infection in cattle. The helminth prevalence in this is also similar to those of Islam *et al*.(2012) and Rashid *et al*.(2013), who reported 78.24% in cattle at Vangura upazilla in Pabla district and 84.8% in Brahman crossbred cattle in Bangladesh. Alam, (1993) recorded that 63.32% single parasitic infection in Bangladesh which is almost similar with the record found in this record (67.8%).

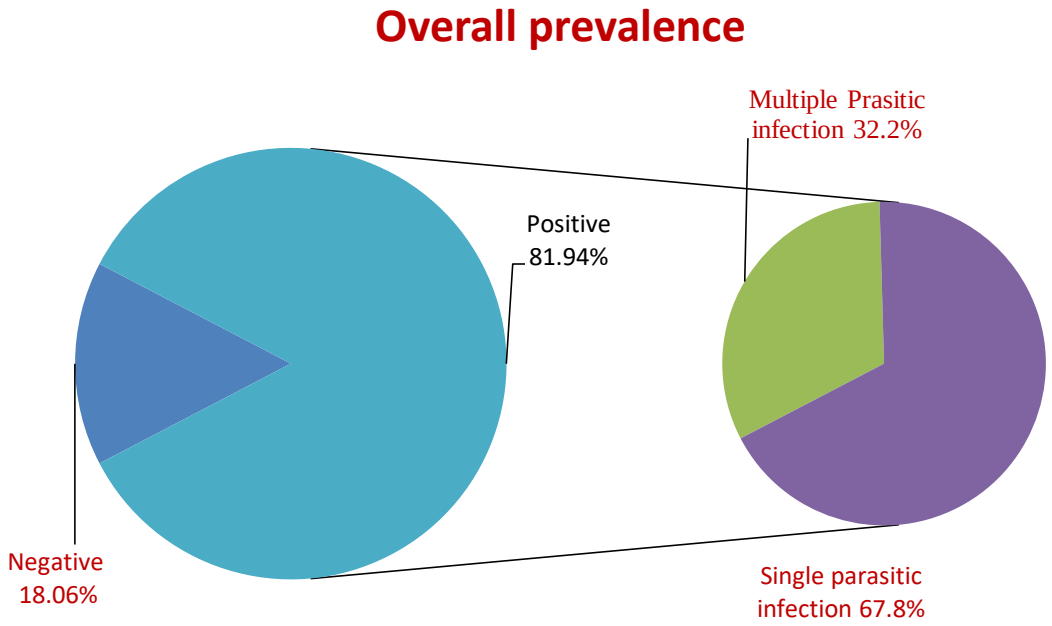


Figure 4: Overall prevalence rate cattle along with single and multiple infections

In this study total six types of GI helminths were found. Out of them two are trematodes and four are nematodes. *Fasciola gigantica* is the highest prevalent parasite (27.08%) in this study which is supported by Haleem *et al*. (2016), who recorded the prevalence rate of Fascioliasis as 25 in his study in Pakistan. Affroze *et al*., (2013) recorded a 31.1% prevalence of fascioliasis through coprological examination in Netrokona district, Bangladesh. However this prevalence differs from the findings of Yadav et al, (2015) and Karim et al. (2015) who found the prevalence rate of Fascioliasis as 51% and 66.14% respectively. Hassan *et al.(*2014 *)* recorded 20% prevalence rate of *Paramphistomum* spp. in his study which is supported by the findings of this study (23.61%). Kabir *et al*., (2018) also recorded 22.9% prevalence of Amphistomes in Sher-e-Bangla Nagar area of Dhaka. However the result differs from results recorded by Chowdhury *et al.* (2016) and *Paul et al.(*2011) who recorded 36.87% and 53.1 % prevalence in Sirajgonj and Sylhet, respectively. Ilyas *et al*.(2016) recorded 4.32% Ascariasis in his study which is close to the findings of this study (2.08). However it differs from the findings of Sardar *et al.* (2006) who recorded prevalence of Ascaris 17.22% and 21.67% in native and crossbred cattle, respectively. Strongyle infection was found 18.76% by Das et al. (2016) in Asam which supports the finding of the study (20.13).However, it differs with the recordings of Islam *et al.(2014)*by a wide margin(1.17). Swarnakar *et al.* (2015) found the prevalence of Strongyle (35.41%) in Udaipur district, India. Prevalence of *Oesophagustomum s*pp.in this study (1.38%) matches with the findings of Chowdhury et al.(2017) which is 2%. But findings of Kabir *et al.(2018)* differs from the findings of this study by a short margin(8.2%). It also slightly differs from the findings (8%) of Ahmed *et al*.(2015). Prevalence of *Hameonchus* spp.in this study is recorded 13.88% which is slightly higher than findings of Alim *et al.(*2012), and Islam *et al.*(2014). They recorded the prevalence of *Hameonchus* spp. 5.56% and 3.52% respectively in their individual study in Chittagong and Vangura(Pabna). *Hameonchus* spp. shows prevalence of 35% in cattle in the study of Bibi *et al.(*2017*)*, in Pakistan.

The variation with the findings of the present study was very high which might be due to the geographic difference, sample size and awareness of farmers on the use of anthelmintics.

Table 1: Overall prevalence of gastrointestinal parasites in cattle

GI Helminth Species	Name of total sample	Prevalence%
Fasciola gigantica	39	27.08
Amphistomes	34	23.61
Strongyloides spp.	29	20.13
Haemonchus spp.	20	13.88
Ascaris spp.	3	2.08
Oesophagustomum spp.	2	1.38
Total	**N=144**	**Overall prevalence 81.94%**

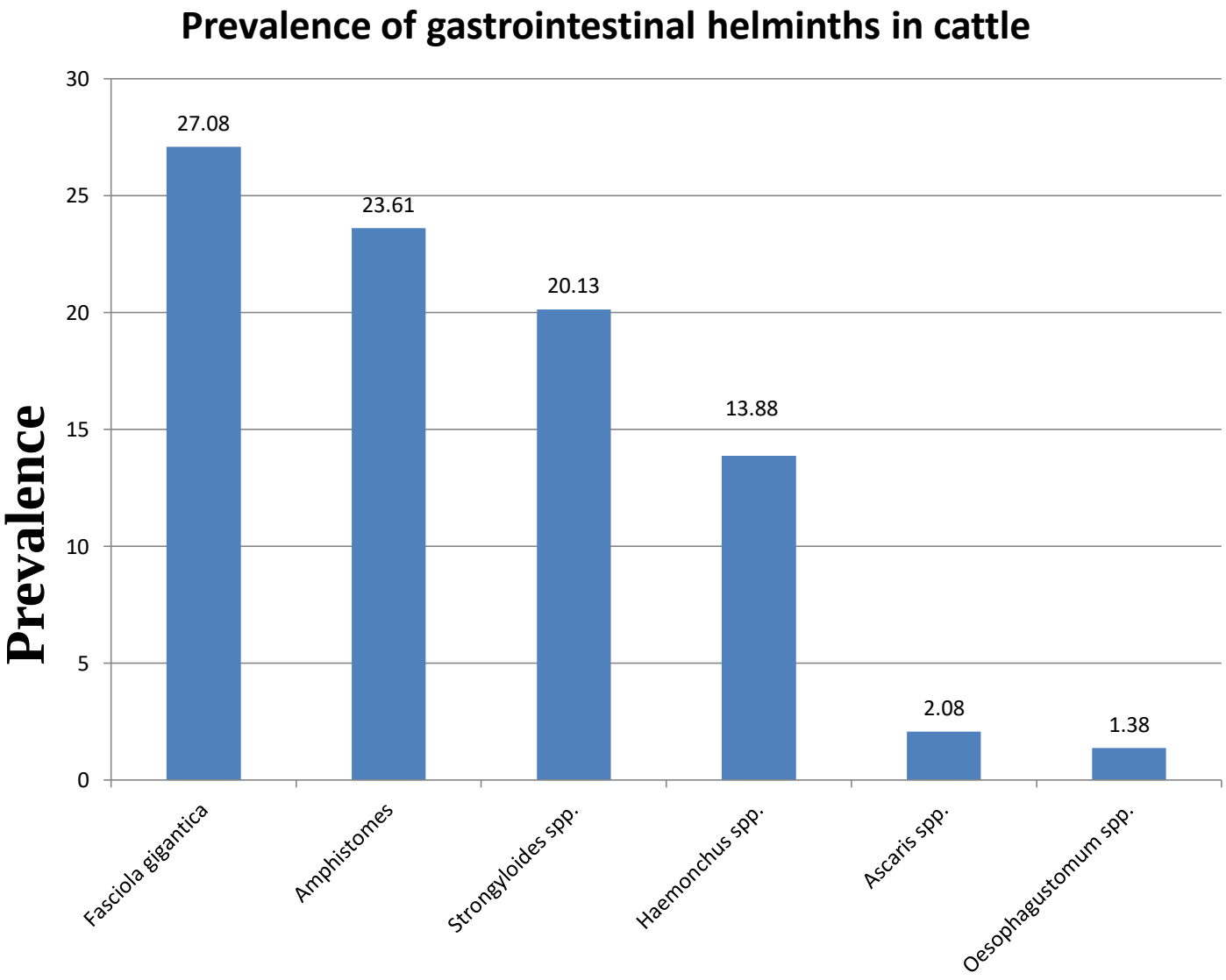


Figure 5: Prevalence of gastrointestinal helminths in cattle

4.2. Age related prevalence: All 144 samples were categorized into 2 groups, older and young. 75 samples were collected from older cattle group more than 2 year of age. 69 samples were collected from younger cattle group under 6 months. In the younger group 54 samples were positive (prevalence 78.26%) and in the older group 64 samples were positive (Prevalence 85.33%). Higher prevalence of parasitic infection in adult cattle might be due to keeping them for a longer period of time in breeding and milk production purposes or supplying inadequate feed against their high demand. Moreover, stress like

lactation, pregnancy, nutritional deficiency which might be accounted for higher prevalence in adult cattle. (Radostits O, Blood DC, Gay CC ; 1994 A text book of disease of cattle, sheep, pigs, goats and horse).

A study of Islam *et al.* (2012) recorded prevalence rate of 85.71% and 71.67% in cattle over 2 years and cattle under 1 year of age respectively. The prevalence rate of cattle over 2 years old (85.33%) is close to that study found in this study. Prevalence of *Fasciola* spp. and *Haemonchus* spp. was higher in adults in this study which is supported by the study of M.Z. Hassan *et al,(*2014) in cattle in Savar.

Fig 6: Age related prevalence of gastrointestinal parasites in cattle

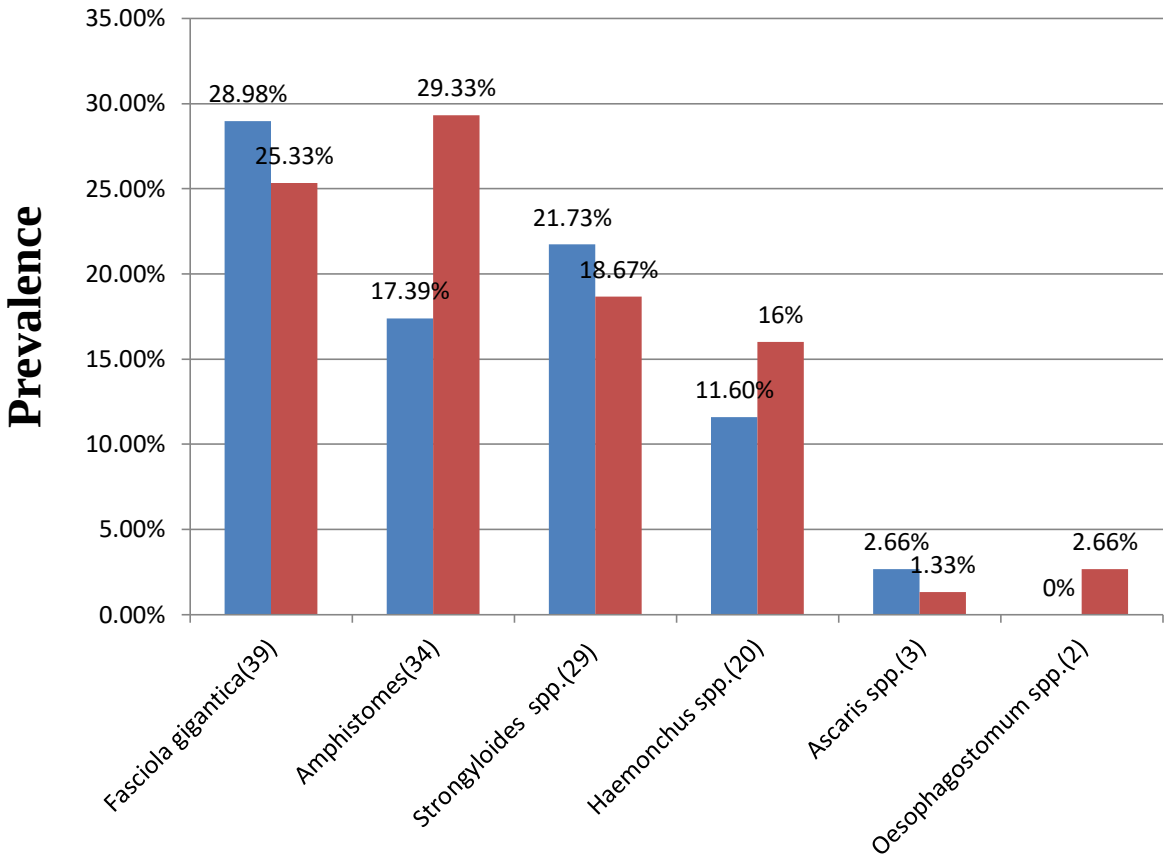


Table 2: Age related prevalence of gastrointestinal helminth in cattle

GI Helminths	6 months-2 years	Prevalence Of individual parasite	Prevalence In younger cattle	Over 2 years	Prevalence Of individual parasite	Prevalence In older cattle
Fasciola gigantica(39)	20	28.98		19	25.33	
Amphistomes(34)	14	17.39		22	29.33	
Strongyloides spp.(29)	15	21.73		14	18.67	
Haemonchus spp.(20)	8	11.60	78.26	12	16	85.33
Ascaris spp.(3)	2	2.66		1	1.33	
Oesophagostomum spp.(2)	0	0%		2	2.66	
Total	**N= 69**	**78.26**		**N= 75**	**85.33**	

Prevalence of *Fasciola gigantica* was higher in younger cattle which is supported by the study on bovine fascioliosis in Mirjagonj upazilla, Patuakhali by Howlader *et al*.,(2016)in his study of. This finding is also supported by the previous reports of Rahman and Mondal (1983) who recorded heavy infection in cattle of 2-3 years of age than the young. The finding of the present study was supported by a recent research work Nath *et al.* (2016), who reported young (6 to 18 months) are more infected with *Fasciola spp*. compared to adult animals. Chowdhury *et al*.(2016), recorded higher prevalence value of *Pasramphistomum* spp.*(36%)* than younger in (30%) her study. . Paul et al.(2011) recorded Paramphistomiasis in cattle at selected areas of Sirajgonj is 44% & 54% respectively in youngers and adults. *Ascaris* spp. Was prevalent in 6.1% of the animals and this was mostly in calves found by Squire *et al*.(2013).

4.3. Season wise Prevalence

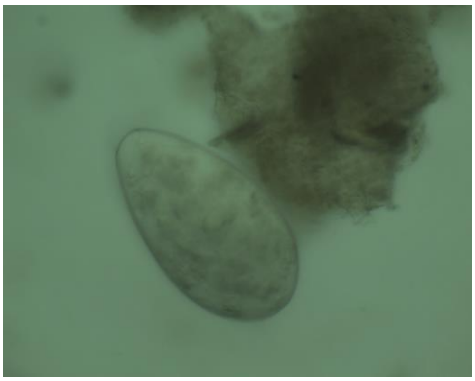
Climate plays an important role in the transmission of helminth infections (Moyo *et al.*,1996). Survival and transmission of eggs and larvae of parasites depend mainly on climatic conditions at natural pasture (Pfukenyi and Mukaratirwa, 2013)**.** Different local climatic conditions like humidity, temperature, rainfall, vegetation and management practice have a profound effect on prevalence of gastrointestinal tract (GIT) parasites. Ruminants specially cattle, sheep, goat are susceptible to gastrointestinal parasitic infestation in low lying grazing areas which remains water filled most of the time. The intermediate hosts are also available in this area. In the study area of this research work, high temperature and humidity may influence the growth of gastrointestinal parasites in ruminants, as reported by Addisu and Berihu (2014) and Islam *et al.* (2015).

In this study highest prevalence (85.71%.) of parasites was found in the rainy season which was in agreement with the reports of Jeyathilakan *et al.* (2008) and Chavhan *et al*, (2008). It might be due to adequate moisture and optimum temperature which favored the growth and survival of infective stages in the pasture (Shirale *et al.* 2008 and Regassa *et al.*, 2006). This is also supported by Mahrana *et al*, (2016) who has recorded highest prevalence of GI parasites was observed in monsoon (48.38 %) followed by summer (39.00%) and winter (34.61%). On the other hand, subsequent occurrence of gastrointestinal parasitic infections were observed in summer season (81.63%) followed by winter season(79.4%) which showed consistency with the observation of Shirale *et al.* (2008) and Chavhan *et al.* (2008). It might be due to hot humid climate in summer and low temperature in winter season provides unfavourable environment for the survival and development of parasitic larvae (Pfukenyi *et al.*, 2007) which decreased the availability of infective larvae in the pasture (Moyo *et al.*, 1996).

Hassan *et al.(2014)* recorded that Prevalence of endoparasite was more frequent in rainy season followed by summer and winter season which supports the findings of this study.

Table 3: Season related prevalence of gastrointestinal parasites in cattle

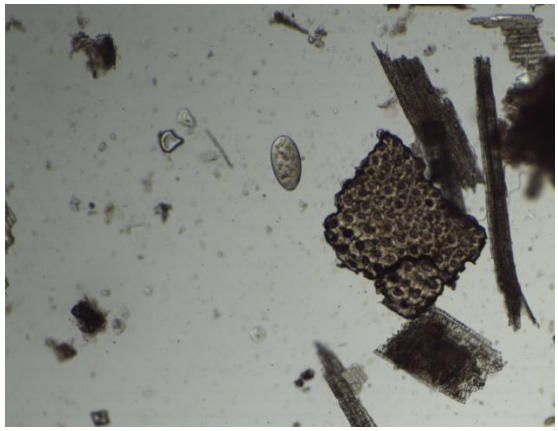
Name of the parasites	Summer season	Rainy season	Winter season	Total number of Helminths	Total sample	Prevalence%
Fasciola gigantica	15	11	13	39		27.08
Amphistomes	13	9	12	34		23.61
Strongyloides spp	10	8	11	29		20.13
Haemonchus spp.	12	5	3	20	144	13.88
Ascaris spp.	3	2	0	5		3.47
Oesophagostomum spp.	0	1	1	2		1.38
prevalence	**81.63**	**85.71**	**79.24**			



(A)

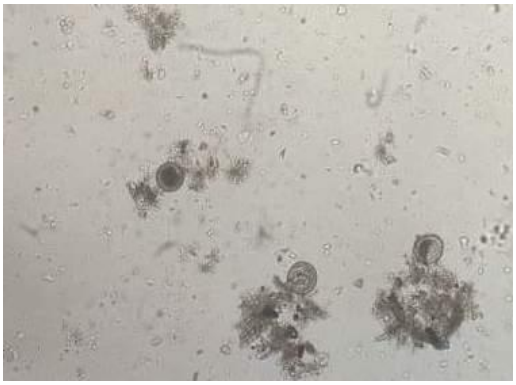
(B)

(C)

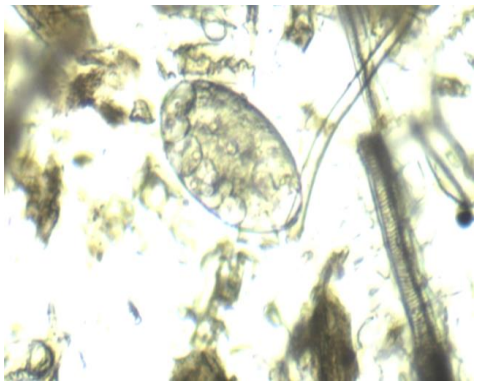


(D)

Figure 7: Different types of Tramatode eggs. A. and B. Eggs of *Fasciola gigantica*. Both are observed under 10x magnifications. **C. and D.** Eggs of *Parumphistomum* spp. observed under 10X and 4X magnification, respectively.



(A)



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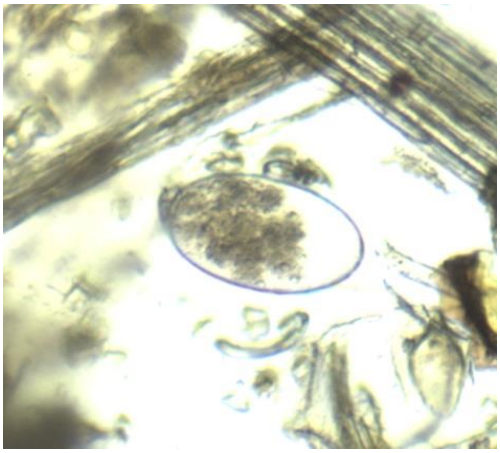

(C)

(D)

Figure 8: Different types of Nematode eggs. A. Egg of *Ascaris* spp**. (**observed under 4X magnification). **B.** Egg of *Haemonchus* spp. (Observed under 10X magnification). **C**. Eggs of *Strongyloides* spp. (Observed under 10X magnification). **D.** Eggs of *Oesophagostomum spp.* observed under 10X magnification. The eggs are ovoid, having a thin shell and contain several cells.

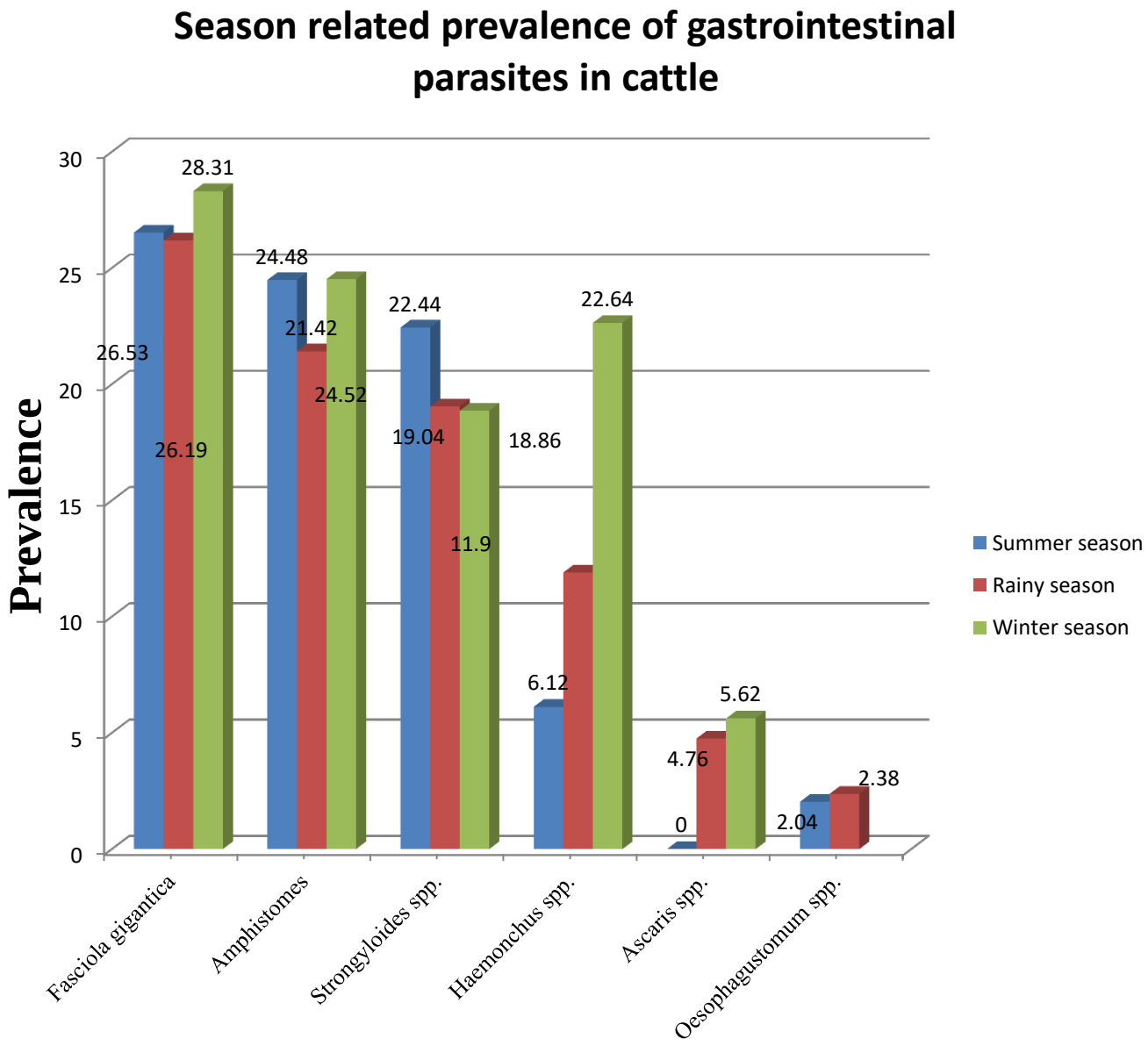

Figure 9: Season related prevalence of gastrointestinal parasites in cattle

4.3.1. Summer season

A total of 49 samples were taken in June, 2019 for the summer season study. 40 positive samples show a prevalence rate of 81.63%. Total 5 types of helminthes were found in the rainy season study .Out of 40 positive cattle 11 shows multiple infection (27.5%).

Samples were randomly taken from crossbreed of HF (n=23), Sahiwal (n=5) Jersy (n=11) and indigenous breeds (n=10) and they show average EPG of 221.1, 225, 200 and 250. Average EPG of Cattle groups with age between 6 months to 2 years (EPG=210) shows less intensity than cattle with age over 2 years (EPG=240).

Table 4: Prevalence of gastrointestinal parasites in cattle in summer season

Number	Helminth	Number	Prevalence%
01	*Fasciola gigantica*	13	26.53
02	Amphistomes	12	24.48
03	*Strongyloides* spp.	11	22.44
04	*Haemonchus* spp.	3	6.12
05	*Oesophagostomum* spp.	1	2.04
Total		**40**	**81.63**

4.3.2. Rainy season findings

In rainy season a total of 42 samples were examined where 36 were positive with a prevalence of 85.71%. Total 6 types of helminthes were found in the rainy season study. Infection with multiple helminthes was present in 12 cases (33.33%). Out of 42 samples the number of HF (LxHF), Jersey (LxJ) and local was 18, 13 & 11 respectively. Average EPG of HF, Jersey and local cattle were 172, 188 and 198 respectively. Cattle aged between (6 months-2 years) showed lower EPG (average EPG 140) than younger cattle over 2 year (average EPG 195) age.

Table 5: Prevalence of gastrointestinal parasites in cattle in rainy season

Number	Parasite	Number	Prevalence%
01	*Fasciola gigantica*	11	26.19
02	Amphistomes	09	21.42
03	*Strongyloides* spp.	08	19.04
04	*Haemonchus* spp.	5	11.9
05	*Ascaris* spp.	2	4.76
06	*Oesophagostomum* spp.	1	2.38
Total		**36**	**85.71**

4.3.3. Winter season findings:

In winter season a total of 53 samples were tested. 42samples were positive with a prevalence of 79.24%. Total 5 types of helminthes were found. In 15 cases multiple parasitic infection were found and the rate was 35.71%. Out if 53 samples 5 was Local breed, 27 were Holstein Friesian (LxHF), and 14 were Jersey (LxJ), 7 were Sahiwal (LxSL). Average EPG was highest in crossbred of Holstein friesian (140), followed by Sahiwal (133.3), Jersey (102.2) and Local (100). Cattle were categorized in 2 groups on the basis of age. Average EPG of younger (6month-2year) groups were (118) less than aged (<2year) group (169).

Table 6: Prevalence of gastrointestinal parasites in cattle in winter season

Number	Parasite	Number	Prevalence%
01	*Fasciola gigantica*	15	28.31
02	Amphistomes	13	24.52
03	*Strongyloides spp.*	10	18.86
04	*Ascaris* spp.	3	5.66
05	*Haemonchus* spp.	12	22.64
Total		**42**	**79.24**

4.4. Breed wise prevalence:

In this study total 144 cattle was examined under 4 types of cattle. Out of them 26 were local cattle originated from Pabna, Munshigonj and RCC etc. type of breed of low milk production. 117 of them was crossbred cow those produce higher amount of milk. Highest number of cattle among the cross breed groups was Holstein (68), followed by Jersey (38) and Sahiwal (12). Prevalence rate was highest in Local breed (88.46%), followed by crossbreed of HF(86.76%), Jersey (76.31%) and Sahiwal (58.33%).

In all three seasons of this study, gastrointestinal parasitic infections were more prevalent in local than crossbred cattle which might be due to communal grazing by local cattle and lack use of anthelmintic treatment. On the other hand, improved husbandry measures along with irregular anthelmintic or sometimes strategic anthelmintic therapy contributed less parasitic infection in crossbred cattle. Alim *et al.(2012)* and Rahman *et al.(2009,)* recorded higher amount of prevalence in indigenous breeds than crossbred.

Table 7: Breed related prevalence of gastrointestinal parasites in cattle

Name of the breeds	Positive	Total cattle	Prevalence%
Local	23	26	88.46
LxHF	59	68	86.76
LxJersey	29	38	76.31
LxSahiwal	7	12	58.33
Total	**118**	**144**	**81.94**

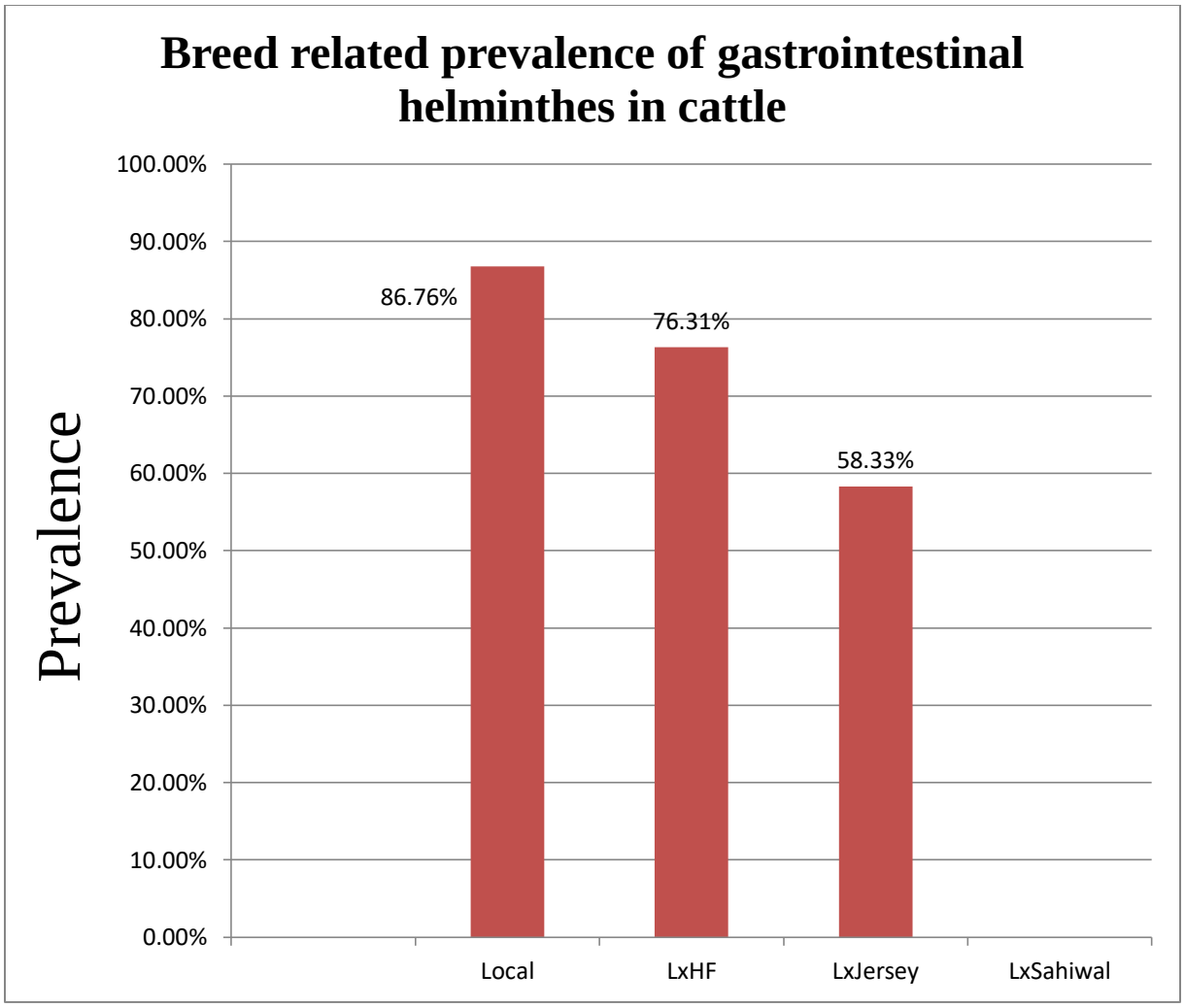

Figure 10: Breed related prevalence of gastrointestinal helminthes in cattle

Table 8: Breed related prevalence of individual gastrointestinal helminth

Name of the parasites		LxHF n=68	LxJ Crossbred N=38		LxS crossbred		Local cattle	
	No of positive samples	Prevalence%	No of positive sample	Prevalence%	No of positive samples	Prevalence%	No of positive sample	Prevalence%
Fasciola gigantica(39)	17	25	8	21.05	5	41.66	9	34.61
Amphistomes(34)	15	22.05	9	23.68	4	33.33	6	23.07
Strongyloides spp.(29)	8	11.76	6	15.78	4	33.33	11	42.30
Haemonchus spp.(20)	7	10.29	4	10.52	5	41.66	4	15.38
Ascaris spp.(3)	1	1.47	0	0	0	0	2	7.69
Oesophagostomum spp.(2)	1	1.47	0	0	0	0	1	3.84
	Total	**86.76**		**76.31**		**58.33**		**88.46**

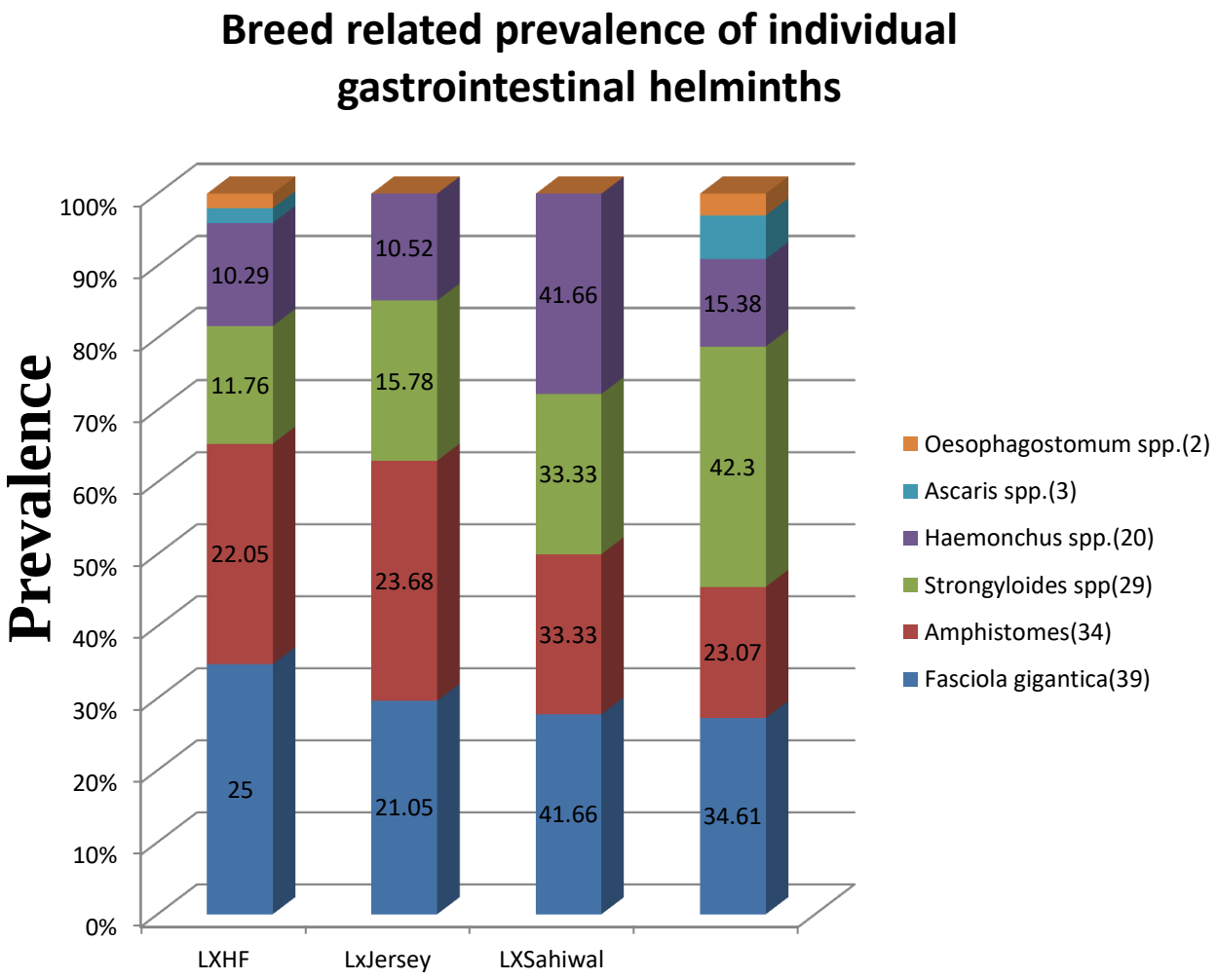

Figure 11: Breed related prevalence of individual gastrointestinal helminths

4.5. Helminth load estimation by EPG

Average EPG of this study over 144 study was observed and average EPG was 211.65 considering all the samples of this study. EPG was highest in rainy season (259.11) followed by summer season 225.11 and winter season (158.18). The study also shows that average EPG was highest in Sahiwal breeds (294). Among the other crossbred group of cattle highest average of EPG was found in HF(202.82) and Jersey (209.47). EPG of local cattle was recorded as 225.12. Kabir *et al*. (2018), studied EPG in fecal sample of cattle in Sher-E-Bangla Nagar area and recorded that it was less than 500. Chowdhury *et al.(1994)* recorded EPG ranging from 100 to 400 (average 138.03) in the zebu cattle of Bangladesh. K.P. Jithendran & T.K. Bhat (1999) recorded the fecal egg counts (eggs per gram, epg) of flukes (Fasciola/Amphistomes) ranged from 50 to 300 in cattle in the North West Humid Himalayan Region of India. Marskole *et al.* (2016), mentioned that the eggs per gram in most of the animals, was in the range of 201-300 in cattle and buffaloes in Jabalpur, India.

Table 09: Season wise EPG in gastrointestinal helminths in cattle

Name of the season	Total number of sample observed	Total number positive sample	Average EPG
Winter season	53	42	158.18
Rainy season	42	36	259.11
Summer season	49	40	225.11
Total	**144**	**118**	**211.65**

As early mentioned, EPG was highest in Rainy season followed by summer and winter season. This finding is supported by Chattopadhyay *et al*, (2013). This is also supported by Rashid *et al*., (2015) who recorded higher amount of EPG in rainy season (477±39.1) than winter (388±29.3). M. Das *et al.* (2020) noticed EPG was recorded during monsoon

(481.01±11.16) followed by post-monsoon (281.59±15.79), pre-monsoon (232.3±13.58) and winter (54.68±13.14).It can be said that rainfall directly influences the pathogenicity of the parasitic infection level. Unlike other bacterial and viral infections, the gastrointestinal parasites maintain a steady host sustainable relationship, which prevents the host from dying out of this infection. Simultaneously, the parasite contributes to a severe loss of production level in animals through nutrition sharing with the host.

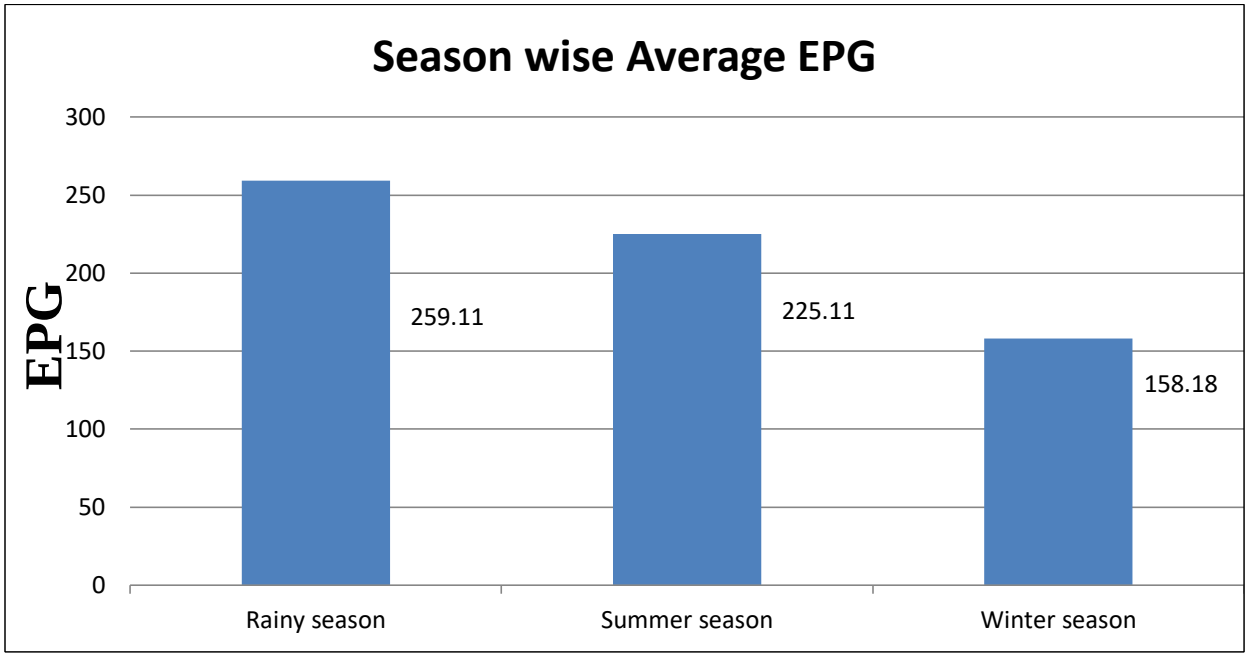

Figure 12: Season wise EPG in gastrointestinal helminth in cattle

EPG was higher in the Sahiwal crossbred cattle (294, n=7) than other crossbred cattle. Among the other crossbred group of cattle highest EPG was found in HF (202.82, n=68), Jersey(209.47, n=29). EPG found in Local cattle is 225.12. In her study, Das *et al.* (2020) mentioned that Mean EPG in cross-bred and non-descript cattle was 617.60±11.81 and 550.44±11.05, respectively which differs with findings of this study.

Table 10: Breed related EPG in gastrointestinal helminth in cattle

Name of the breeds	Total number of sample observed	Number of positive sample	Average EPG
Local breeds	26	23	225.12
HF	68	59	202.82
Jersey	38	29	209.47
Sahiwal	12	07	294
Total	**144**	**118**	**211.65**

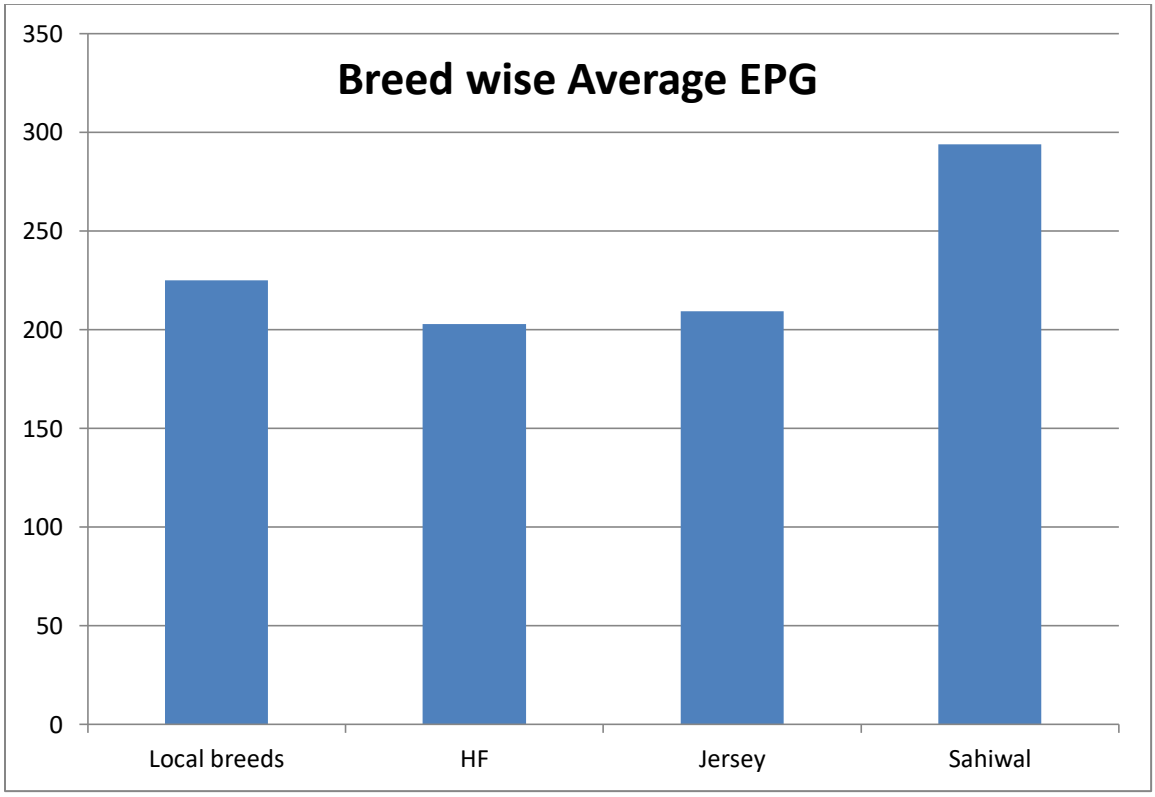

Figure 13: Breed related EPG in gastrointestinal helminths in cattle

CHAPTER 5

SUMMARY AND CONCLUSION

Parasitism is considered as one of the major constraints affecting the health and productivity of livestock specially cattle. This study has recorded 81.94% prevalence in the cattle of Bathan areas (Pabna & Sirajgonj). Only the prevalence rate and intensity were investigated in this study. The effects of parasites in production performance of cattle are essential to be studied which would be more beneficial for the farmers. The geo-climatic conditions together with water-logged areas of the relevant areas are conductive to parasite in grazing ruminants. The hot and humid climates in fact make this area paradise for parasitic animals. Moreover, poor management, insufficient diet, lack of awareness and irregular de-worming practices in the studied area enhanced the prevalence of gastrointestinal helminthes.The study was performed to decide the prevalence of gastrointestinal parasitic diseases in crossbred and native dairy cattle thinking about age, sex and season in selected regions. The investigated data of this study will give a general thought regarding the dissemination of gastrointestinal parasitic contaminations among the investigation territories. It will additionally give some epidemiological thoughts in the event of such infections in cattle. Consequences of this study uncovered that the general commonness of gastro-intestinal helminth contamination in dairy cattle in Bathan territories is extremely high. Various medications are financially accessible in the local market for the treatment against parasitism but most of the farmers are unaware and not properly treated their animals. Therefore, it is suggested that anthelmentic treatment on quarterly basis may be implemented to reduce the risk of re-infection as well as separate grazing practice can be adopted. Further investigations are recommended which will assist with taking mandatory preventive and control measures against parasitism as well as maximize the production.As Domesticated ruminants in Bangladesh are at continuous risk of infection with one or more harmful helminths so, further study should be carried out to determine the economic losses due to parasites of cattle and to find out effective control measures against it. However,

particular emphasis should be given to proper management, regular deworming and improved hygiene, to prevent the parasitic infections in cattle and other animals

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