CHAPTER-I

INTRODUCTION

Livestock is one of the most potential sub-sectors of agriculture in Bangladesh which plays an indispensable role in promoting human health and national economy of the country. Livestock not only assists to upgrade the financial condition but also makes a substantial contribution to human nutrition. However, livestock is an integral part of farming system which has a better contribution to enhance the economy of Bangladesh. Large ruminants (Cattle and Buffalo) and small ruminants (sheep and goat) constitute the major portion of livestock. The present population of livestock is 22.87 million cattle, 1.21 million Buffalo, 20.75 million goat and 2.68 million sheep (DLS, 2008). The total contribution of livestock sub-sector to Gross Domestic Product (GDP) in Bangladesh is approximately 7.23% and livestock in agricultural production 17.32% (Anonymous, 2007). It also generates 13% of foreign currency and provides 20% fulltime employment and 50% partial employment of rural population (Alam, 1993).

In Bangladesh, 80% rural people rear indigenous cattle (Siddiki *et al*., 2009) and many people are also involved with urban and rural dairy farming. Most animals are reared in houses under the traditional husbandry practices. Now a day, dairy farming in rural and urban areas is increasing with modern husbandry practices (Sardar *et al.,* 2006) where cattle are mainly reared for several reasons including meat and milk production (Lako *et al.,* 2007). The production and productivity of animals are greatly hampered by different diseases (Ngole *et al.,* 2004) including gastrointestinal parasitism.

Gastrointestinal parasitism is a world-wide problem (Regassa *et al.,* 2006). It is thought to be one of the major constraints that hinders the development of livestock population (Kakar *et al*., 2008 and Jabber and Green, 1983) and it also adversely affect the health and productivity of animals (Irfan, 1984). The losses caused by parasitic infections are in the form of lowered general health condition, retarded growth rate, diminishing the working efficiency, decrease milk and meat production, abortion, cost associated with preventive measures and reduces the disease resistance capability, which may ultimately lead to higher mortality (Chavhan *et al.,* 2008, Silvestre *et al.,* 2000 and Radostits *et al.,* 1994). However, the geo-climatic conditions of the country also favour the growth, development and survival of various parasites. Occurrence of gastrointestinal parasitic

infections in different areas varies greatly depending upon the diverse intrinsic and extrinsic epidemiological and biological factors associated with them (Sardar *et al.,* 2006). Infections caused by gastrointestinal parasites especially nematodes are one of the major causes of calf mortality and act as a big threat for dairy industry of this country. Earlier reports revealed that 50% calves up to 1 year of age died due to gastrointestinal parasitism (Debnath *et al*., 1995). On the other hand, the adult cattle also severely affect by parasitism as they are kept for a longer period of time in breeding or milk production purposes and often supply insufficient feed against their high demand (Sardar *et al.,* 2006) resulting enormous economic losses. The total annual loss due to gastrointestinal parasites was 25-30 million sterling pounds reported by Rahman (1997). Despite significant losses by gastrointestinal parasitism, the problems are often neglected and overlooked as majority of the infected animals show a number of little obvious clinical signs throughout their productive life and their effects are gradual and chronic (Raza *et al.,* 2010). Epidemiological pattern of the parasitic diseases in the different agro-climatic zones of the country usually provides a basis for developing strategic and tactical control systems against them. In different regions of Bangladesh, several research on gastrointestinal parasitic diseases (Rahman, 1970, Rahman and Razzak, 1973, Rahman and Mondal, 1983, Afazuddin, 1985, Amin and Samad, 1987, Chowdhury *et al.,* 1993, Shahiduzzaman *et al*., 1999, Mondal, *et al.*, 2000, Samad *et al.,* 2004 and Sardar *et al.,* 2006).have been conducted but in Chittagong region (Siddiki *et al.,* 2009 and Alim *et al.,* 2011), it was very meager. Considering the above facts, the present study was undertaken to fulfill the following objectives:

- To investigate the prevalence gastrointestinal parasitic infections in Holstein Friesian crossbred at farm level of three different thanas of Chittagong district.
- To determine the effect of different factors such as, breed, age, sex, etc. in the occurrence of such diseases.

CHAPTER-II

REVIEW OF LITERATURE

Pertinent literatures on gastrointestinal parasitism along with their prevalence in cattle are reviewed in this chapter. The main purpose of this chapter is to provide up-to-date information concerning the research work which is addressed here. Important information related to the present study was represented below under the following headings:

2.1 Gastrointestinal Parasitism

2.1.1 Epidemiology

The development and survival pattern of infective larvae in the environment differs according to the climate. Three broad types of climate are found in tropical and sub-tropical regions:

- Humid tropical climate
- Savannah-type tropical and sub-tropical climate with a long dry season
- Arid tropical and sub-tropical climate

The humid tropical climate characterizes much of West Africa as well as the regions surrounding Lake Victoria and parts of coastal eastern Africa. It is also the climate of much of southeastern Asia, Central America and northern South America.

The parasites' eggs or larva developed into in the fecal material or in environment to make themselves accessible to ingestion by ruminants, the larvae have to migrate or be transported from the faces in which they were deposited on the ground to any nearby herbage. Such movement occurs in two ways: horizontal migration/transport and vertical migration/transport. Embryonation and hatching of the eggs depends on light, temperature, humidity and oxygen and this process does not take place while the eggs are in the faecal mass. The development of larvae in the environment depends upon warm temperature and adequate moisture. In most tropical and sub-tropical countries, temperatures are permanently favourable for larval development in the environment. Exceptions to this are the highland and mountainous regions throughout the world and the winters of southern Africa and Latin America where temperatures may fall below those favourable for the development larvae. The ideal temperature for larval development of many species in the microclimate of the tuft of grass or vegetation is between 22° and 26°C. Some parasite species will continue to develop at temperatures as low as 5°C, but

at a much slower rate. Development can also occur at higher temperatures, even over 30°C, but larval mortality is high at these temperatures. The ideal humidity for larval development in this microclimate is 100%, the minimum humidity required for development is about 85%. The survival of larvae in the environment depends upon adequate moisture and shade. Desiccation from lack of rainfall kills eggs and larvae rapidly and it is the most lethal of all climatic factors. (Hansen and Perry, 1993)

2.2 Factors affecting the size of gastrointestinal infections

The size of any gastrointestinal nematode infection depends on the following five main factors:

- The number of infective larvae/eggs ingested by the host, which in turn is influenced by the climate, the amount of protection provided by vegetation, the livestock density and the grazing pattern of the ruminants present.
- The rate at which acquired resistance develops in the host, which is influenced by the species of the parasite and host, genetic factors, nutrition and physiological stress (e.g., parturition).
- The intrinsic multiplication rates of the species of parasites present which are controlled by the fecundity, pre-patent period, environmental development and survival rates of these species.
- Management, particularly grazing patterns (Radostits *et al.,* 1994).
- Geographical distribution and availability intermediate hosts
- Use of anthelmintics, including the timing and frequency of administration.

(Radostits *et al.,* 1994 and Hansen and Perry, 1993)

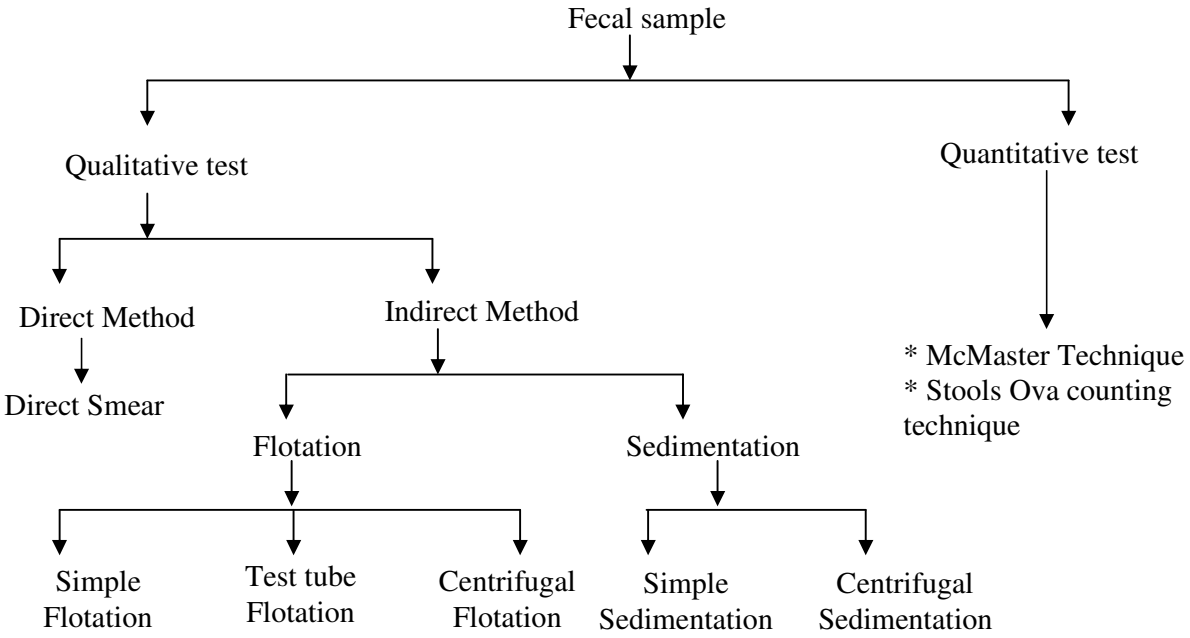
2.3 Diagnosis of gastrointestinal parasitism

To diagnose gastrointestinal parasitic infections of ruminants, the parasites or their eggs/larvae must be recovered from the digestive tract of the animal or from faecal material. These are subsequently identified and quantified. The following are the main tasks involved in this process:

- Collection of faecal samples
- Separation of eggs/larvae from faecal material and their concentration
- Microscopical examination of prepared specimens
- Preparation of faecal cultures

- Isolation and identification of larvae from culture (Baermann apparatus techniques)

The following Qualitative and Quantitative tests were used for the diagnosis of gastrointestinal parasitism



(Urquhart *et al*., 1996, Hansen and Perry, 1993, Soulsby, 1982 and Benbrook and Sloss, 1962).

2.4 Pevalence of gastrointestinal parasitic infection in Bangladesh

In East Pakistan (Now **Bangladesh**), the prevalence of gastrointestinal parasitic infection was detected after examination of 200 abomasums. The recorded species of nematode were *Mecistocirrus digitatus* (44%), *Haemonchus contotus* (10%), *Haemonchus similis* (21%), *Cooperia punctata* (37%), *Ostertagia trifurcata* (1%) and *Bunostomum* spp (4%) (Rahman, 1970). In another investigation, it was observed that overall prevalence of gastrointestinal parasitic infection was 71.6%, and 14.6% in cattle and goats, respectively (Bhuyan, 1970).

In different areas of Bangladesh, several investigations were carried out on gastrointestinal parasitism. In an investigation, it was observed that cattle harbor at least 10 species of trematodes, 2 adult cestodes, two larval cestodes and 21 species of

nematode. Multiple infections with different species of helminthes were recorded in fifty one cattle. Concurrent infection with most harmful helminthes recorded as *Fasciola gaigantica*, *Schistosoma indicum*, *Schistosoma spindalis*, *Mecistocirrus digitatus*, *Trichostrongylus axei*, *Oesophagostomum radiatum*, *Haemonchus* spp were recorded in twenty one cattle above six years of age (Rahman and Mondal, 1983). In another study, prevalence of gastrointestinal parasitism in cattle was recorded as *Toxocara* spp 7.1%, *Strongyles* spp 26.4%, *Strongyloides* spp 9.2% and *Trichuris* spp 5.8% (Rahman and Ahmed, 1991).

In Mymensingh, an investigation was conducted to determine the concurrent infection of gastrointestinal parasites and Bacteria associated with diarrhea in calves. It was revealed that 67% calves affected with different parasites and 98% with different bacteria. Of the 67 and 98 calves affected with parasites and bacteria, of which 65.67% and 61.22% had single, 29.85% and 37.76% had dual and only 3.33% and 1.02% had triple concurrent infection, respectively. Highest rate of gastrointestinal nematodes (GIN) infection (48%) was recorded in calves, followed by *Eimeria* spp (27%), *Toxocara vitulorum* (14%) and lowest (1%) with each of the *Strongyloides*, *Paramphistomum* and *Moniezia* sp (Samad *et al.,* 2004). In a different study, it was showed that the overall prevalence of *Paramphistomum* spp infection was 25%, 30.56%, Ascaris 17.22%, 21.67%, *Strongyloides* spp 8.89%, 9.17%, *Trichuris* spp 6.11%, 8.61%, *Schistosoma* spp 29.44%, 37.78% and *Moniezia* spp 8.33%, 9.44% in native and crossbred cattle, respectively. It was also observed that infection rates of *Ascaris, Strongylid* and *Strongyloids* were very high in the young animals starting from the age group < 12 months and gradually declined. In the age group > 24-36 months and > 36 months, the infection rates were very much and the rates were almost similar in both native and crossbred cattle. The infection rates of *Fasciola, Paramphistomum, Trichuris* and *Schistosoma* were highest in the age group > 36 months and lowest in age group < 12 months. The highest prevalence rates of different parasites were observed in the rainy season (July to October) except in case of *Ascaris*. The infection rate of *Ascaris* was highest in winter (Sardar *et al.,* 2006).

In a new investigation, two tracer animals (two cow calves and two goats) were released for a month in grassland used for communal grazing of livestock near school premise in Kanthal, Trishal, Mymensingh to determine the association of grassland with parasitic diseases of livestock. After slaughtering, the determined species were *Haemonchus*

contortus, *Trichostrongylus axei*, *Mecistocirrus digitatus*, *Oesophagostomum* spp, *Trichuris* spp, *Bunostomum* spp and *Moniezia* spp. The numbers of parasites in each cow calf were from 42 to 154 for *Haemonchus contortus*, from 18 to 33 for *Trichostrongylus axei*, from 15 to 34 for *Mecistocirrus digitatus*, from 22 to 47 for *Oesophagostomum* spp, from 23 to 32 for *Trichuris* spp, from 13-32 in *Bunostomum* spp and from 3 to 16 for *Moniezia* spp. The numbers of parasites in each goat were from 22 to 45 for *H. contortus*, from 10 to 27 for *T. axei*, from 24 to 160 for *Oesophagostomum* spp, from 16 to 35 for *Trichuris* spp, from 2 to 8 for *Bunostom*um spp and from 12 to 21 for *Moniezia* spp (Mondal *et al.*, 2000).

In comilla, an epidemiological investigation was conducted on gastrointestinal parasites of cattle where 37% animals were found positive, infected with one or more helminthes. The prevalence of *Paramphistomum* spp was 62.60%, *Fasciola gaigantica* 16.3%, *Schistosoma indicum* 1%, *Neoascaris vitulorum* 0.9%, *Trichutris* spp 8.8%, *Strongyloides* spp 3% and *Strongylus* spp 36.70% where Strongylus infection increased in monsoon and winter whereas *Fasciola* spp and *Paramphistomum* spp increased only in monsoon (Rahman and Razzak, 1973).

In Tangail district, prevalence of *Paramphistomum* spp infection was 64.4%, *Capillaria bovis* 12.2%, *Strongylus* spp 34%, *Fasciola* spp 22.4%, *Balantidium coli* 13.6%, Coccidia 12.2% and *Strongyloides papillosus* 1.6% where 50% of the studied cattle were infected with two or more different parasitic species (Garrels, 1975).

In Savar, the highest prevalence of gastrointestinal parasitic infection was *Strongylus* spp (77.2%) followed by *Trichuris* spp (11%), *Capillaria* spp (8.8%), *Strongyloides* spp (7.4%) and *Toxocara* spp (6.6%) where *Strongyloides* spp was significantly higher in male calves (Chowdhury *et al.,* 1993). The highest prevalence of gastrointestinal parasitic infection was recorded in summer (27.6%) followed by autumn (11.4%), spring (10.6%) and winter (9.3%) in cattle of Savar Military Dairy Farm, Dhaka (Afazuddin, 1985). On the other hand, similar type of result was found in Gazipur, which was 12.7% in summer, 11.7% in spring, 10.4% in autumn and 9.4% in winter (Amin and Samad, 1987).

In Chittagong, a one year (2009-10) prevalence study on gastrointestinal parasitism was conducted in crossbred and local cattle where 216 crossbred and 432 local cattle of four

representative areas were considered. The author recorded the overall prevalence of gastrointestinal parasitic infections recoded 39.75% and 46.25% in crossbred and local cattle, respectively. Frequency of Trematodes and Nematodes infections was persistent in all the study areas. The highest prevalence of Trematodes infections was found in Boalkhali (32.41%) compared to Noakhali (23.14%), Rangunia (18.53%) and Khagrachori sadar Upazila (17.60%). The investigation also revealed that prevalence of Nematodes infection was the highest (25.93%) in Noakhali sadar Upazila in local cattle. Occurrence of gastrointestinal parasitic infections was more common in rainy season followed by summer and winter. 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 ($P<0.05$). *Paramphistomum* spp infections were more frequent in adult while *Toxocara* spp were predominant in calf ($P<0.05$). Prevalence of *Haemonchus* spp (4.86%) infections was significantly higher in local adult cattle whereas *Trichostrongylus* spp (4.86%) infections were predominant in local young cattle ($P<0.05$). The author also suggested that breed and season, age were the important predictor of gastrointestinal parasitism (Alim *et al.,* 2011).

2.5 Prevalence of gastrointestinal parasites diseases in other countries

In Pakistan, the overall prevalence of endoparasites in youngstock of Holstein-Friesian and Jersey breeds was 39% and 38.21%, respectively in Kasur district (Zahid *et al.,* 2005) whereas liver parasites in cows was 45.70% in Quetta city. The highest prevalence was found in *Fasciola hepatica* (16.16%) infection followed by *Fasciloa gigantica* (12.37%) and *Paramphistomum explanatum* (7.82%) (Kakar *et al.,* 2008). In Karachi, 8.50% (Baliquees and Alam, 1988) and 8.00% (Sabri *et al.,* 1981) incidence of Fascioliasis and 17.64% Paramphistomiasis (Reza *et al.,* 2009) was recorded in cows in Tehsil Jatoi district. However, infestation of Paramphistomiasis varies from 0.70 to 88.89% from place to place (Georgiev *et al.,* 1980 and Gupta *et al.,* 1978) due to variation in geo-climatic conditions of the areas. In Panjab, another study was carried out to determine the prevalence of gastrointestinal helminthiasis in ruminants. The overall prevalence of helminthiasis was 51% in cattle, 47% in buffaloes, 62% in sheep and 52% in goat, with nematodes being the most common helminths. It was also found that the prevalence of helminths was higher in young animals in compared with adult cattle. Sex-wise prevalence of helminths was higher in males than females for buffaloes and sheep in contrast to cattle and goats (Reza *et al.,* 2007). In district Toba Tek Singh, Punjab, the

prevalence of GI helminths was significantly higher in sheep (44.17%) followed by goats (40.15%), buffaloes (39.82%), and cattle (33.68%). The prevalence of GI helminths except *F. hepatica* and *F. gigantica* was significantly higher in grazing animals, females and young when compared with stall-fed animals, males and adults, respectively (Khan *et al.,* 2010). In Farooqa area, the total point prevalence of gastrointestinal parasites was found to be 85.75%. The highly prevalent species were *Fasciola hepatica* 70.62% followed by *Ascaris vitulorum* 21.36% and *Haemonchus contortus* 8.01%. In Kot Addu, the total prevalence of gastrointestinal parasites was found to be 60.81%. The prevalent species of this area included *Haemonchus contortus* 31.85% followed *Ascaris vitulorum* 28.14%, *Bunostomum phlebotomum* 23.7% and *Fasciola hepatica* 16.29%. In the area of Dunya Pur, the prevalence of worm infection was 51.88%. The highest prevalence was observed for *Haemonchus contortus* 46.66% followed in order by *Fasciola hepatica* 32.12% *Ascaris vitulorum* 8.48%, *Ostertagia circumcinta*6.66%, *Bunstomum phlebotomum* 6.06%. In Layyah, the prevalence of different species of helminths was 19.7%. The highly reported species included *Ascaris vitulorum* 33.92% followed in order by *Haemonchus contortus* 30.35%, *Fasciola hepatica* 21.42%, *and Oesophagostomum radiatum* 14.28%. The survey of Mor Mandi area of district Jhang revealed that the total prevalence of helminths in this area was 54.16%. The species-wise prevalence was found highest for *Fasciola hepatica* 40.0% followed in order by *Haemonchus contortus* 23.07%, *Oesophagostomum radiatum* 20.0%, *Ascaris vitulorum* 16.92%. In district Shorkot, prevalence of helminths was found to be 52.84%. The prevalent species included *Fasciola hepatica* 46.23 followed in order by *Haemonchus contortus* 21.5%, *Trichostrongylus* spp 20.43% and *Ascaris vitulorum* 11.82%. (Iqbal *et al.,* 2007). At Multan, the point prevalence of *Toxocara vitulorum* in buffalo and cattle slaughtered at abattoir was 63.83% and 37.50% in buffaloes and cattle, respectively. Sex wise prevalence of *T. vitulorum* was recorded as 39.46% in male and 72.72% in female (Raza *et al.,* 2010).

In India, the overall prevalence of gastrointestinal parasitic infections in crossbred cows and buffaloes of Namakkal was 30.0% and 24.6%, respectively. The prevalence rates of round worms, intestinal coccidia, flukes and tapeworms were 18.6%, 4.3%, 2.9%, and 1.0%, respectively. The percentage of animals infected with Strongyles, *Eimeria* spp, *Amphistoma* spp, *Trichuris* spp, *Toxocara* spp, *Schistosoma* spp, *Moniezia* spp and *Strongyloides* spp were 14.8% (composed of *Haemochus* and others at 77.4% and 22.5%,

respectively), 4.3%, 1.9%, 1.9%, 1.4%, 1.0%, 1.0% and 0.5%, respectively. Mixed infection of coocidial oocysts and Strongyles was observed in 2.4% animals. The age-wise prevalence rate of gastrointestinal parasites among the total number of animals examined were 22.6%, 27.8%, 27.0%, 25.8% and 41.7% for calves and heifers (2.5 years old), first calving (2.5-3.5 years old), second calving (3.5-4.5 years old), third calving (4.5-5.5 years old) and fourth calving (5.5-6.5 years old) animals, respectively (Saravanana *et al.,* 2009). In Tamil Nadu, India, a systematic survey was conducted to determine the prevalence of *Schistosoma spindale* in cattle, buffalo and goat slaughtered at Chennai. Examination of mesenteries collected from slaughter houses revealed 30.7% cattle, 19.64 % buffalo and 9.52% goat harbouring *S. spindale*. The prevalence of *S. spindale* was higher in cattle followed by buffalo and goat. The seasonal pattern of prevalence showed a moderate peak in monsoon season in cattle and winter season in buffalo and goat (Jeyathilakan *et al.,* 2008). However, in Assam, prevalence of *Schistosoma spindale* was 2.9% in cattle, 2.7% in goat and 16% in buffalo (Rajkhoa *et al.,* 1992). In Akola district of Western vidarbha region, India, out of total 232 positive samples, 62.29% had single and 6.00% had mixed infection of *Haemonchus* and *Trichuris* spp. The prevalence of intestinal helminths were *Strongyles* spp 19.39%, *Strongyloides* spp 11.14%, *Trichoderma* spp 8.28%, *Haemonchus* spp 6.57%, *Trichuris* spp 5.42%, *Trichostrongylus* spp 4.85%, *Moniezia* spp 4.18%, *Foxiola* spp 3.71% and *Coccidia* spp 3.14% in cattle. The seasonal prevalence of gastrointestinal helminthic infection revealed higher prevalence of parasites in rainy season 91.20%, followed by winter 69.5% and summer 40.91% (Shirale *et al.,* 2008). In Himachal Prodesh, the overall percentage of infection of gastrointestinal parasites (either singly or mixed infection) in cattle during the period of 1986-90 and 1993-98 were 87.2 % and 54.2%. The prevalence of *Fasciola spp, Amphistome spp, Dicrocoelium spp, Schistosoma spp, Moniezia spp, Strongyle spp, Strongyloides spp, Toxocara spp, Dictyocaulys spp, Trichuris spp and Capillaria spp* were 36%, 16.6%, 11.4%, 0.6%, 2.9%, 31.4% 9.1% 3.9%, 1.9%, 5.2%, and 1.4% , respectively in 1986 - 1990, whereas percentage of infection with the same species reduced to 6.3%, 15.1%, 2.1%, 0.0%, 0.9%, 13.5%, 1.7%, 2.1%, 0.7%, 0.0% and 0.9%, respectively in 1993- 1997(Annual reports. 1990-98, Himachal Pradesh Krishi Vishwa Vidyalaya, Palampur, Himachal Pradesh). In Gujarat, a two years long investigation revealed that prevalence of gastrointestinal parasites in cattle was 45.8% where amphistomes (17.9%), Strongyles (14.2%) and Coccidia (7.5%) were predominant parasites and highest infection rate was found in rainy season. (Hirani *et al.,* 2006). In

Karnataka, overall prevalence of nematode infection was 18.2% and 20.9% in cattle and buffalos, respectively. *Strongylus* spp was found more predominating in cattle and *Neoascaris* spp in buffalo (Muraleedharan, 2005)**.** In Nagpur, a year round study at two villages namely, Chicholi and Bodala revealed that the overall prevalence of nematodes infections were 39.34%. The infection rate in buffalo, cattle and goat was 41.63%, 32.18% and 51.94%, respectively. Higher infection was recorded during monsoon (63.07%) followed by winter (32.22%) and summer (21.33%). The percentage of animals infected with *Haemonchus* spp, *Toxocara* spp, *Trichuris* spp, *Strongyloides* spp. and mixed infection was found to be 38.01%, 27.68%, 14.87%, 11.98% and 7.43%, respectively (Chavhan *et al.,* 2008).

In USSAR, Trichostrongylid represented 92.2% of all nematode infection in small ruminants. It was observed that prevalence of such parasitic infections arose from 84% in spring to 100% in winter. The dominant species were *Marshallagia marshalli* (65%), *Haemonchus contortus* (48.3%) and *Ostertagia circumcincta* (38.3%). The prevalence of *Haemonchus controtus* decreased during summer grazing, as the ova do not survive in pasture at 200 meters above sea level (Dadaev and Zimin, 1981).

In Italy, an epidemiological investigation on GI parasitic infections in 5 to 12 years old cattle of Cuneo province showed that the prevalence of *Ostertagia ostertagi* infection was 82% followed by *Haemonchus placei* 61%, *Cooperia oncophora* 27% and *Trichostrongylus axei* 25%. The highest infection was recorded during spring when animals were put on pasture (Bulbo, 1973).

In Turkey, a prevalence survey in cattle of central Afyonkarashisar revealed that Strongyle types of eggs were observed in 26.39% of the fecal samples. The infection was found to be less prevalent in the spring (22%) and most prevalent in autumn (32.53%). The genus of larvae observed in fecal cultures were *Haemonchus* spp 25.25%, *Trichostrongylus* spp 23.71%, *Nematodirus* spp 16.49%, *Ostertagia* spp 10.30%, *Cooperia* spp 8.76%, *Bunostomum* spp 6.70%, *Oesophagostomum* spp 6.18% and *Chabertia ovina* 2.57%. *H. contortus* and *Oesophagostomum venulosum* (20.83%), *O. radiatum* (16.66%), *Cooperia onchophora* and *Ostertagia ostertagi* (8.3%), *O. trifurcata, C. punctata* and *Chabertia ovina* (4.16%) were found during inspections of the gastrointestinal tract (Seyimli *et al.,* 2007). In Erzurum region, it was revealed that *Toxocara vitulorum* eggs were found in 22.2% of the calves' feces. The prevalence in

calves smaller than 6 months of age was 24% and 10.6% in 6-12 months old (Avicoglu and Balkaya 2011). In Hakkari, eastern region of Turkey, prevalence of *T. vitulorum* infection was 28.96%. 34.4% infection rate was found in 1-6 month age cattle, followed by 6.6% in 6 months - 1 year old cattle and 3.3% in >1 year old cattle (Aydin *et al.,* 2006*).* On the other hand, in Bursa, prevalence of *Toxocara vitulorum* was 5.1% in calves younger than 6months old and 2.2% in all ages of animals (Akyol, 1993). In barns in Kayseri province, the prevalence of *Parmphistomum* spp was 14.5%, *Strongyles* spp 12%, *Toxocara vitulorum* 0.5%, *Moniezia* spp 1% and *Fasciola* spp 7.5% (Yldrm *et al.,* 2000).

In Syria, examination of 34 stomach and small intestine and large intestine of 4 more Syrian cattle revealed the prevalence of nematodes which were as follows: *Ostertagia ostertagi* 76%, *Cooperia oncophora* 76%, *Cooperia punctata* 05%, *Trichostrongylus axei* 17%, *Cooperia zurnabada* 23%, *Bunostomum phlebotomum* 58%, *Haemonchus contortus* 64% and *Trichostrongylus vitrinus* 76% (Moukdad, 1979).

In Japan, a parasitological survey by post-mortem examination of the abomasum and the upper small intestine of cattle of Hokkaido region revealed that the prevalence of GI nematodes were 56%. They were *Ostertagia ostertagi* (47%), *Mecistocirrus digitatus* (29%*), Haemonchus placei* (1%), *Namatodirus helvetianus* (1%), *Bunostomum phlebotomum* (1 %), *Trichostrongylus axei* (3%), *Cooperia oncophora* (3%) and *C. punctata* (1%). In another investigation, eggs of GI nematodes were found in 74% of the 231 cattle faecal samples examined. The incidences of the various species were *Ostertagia* (62.7%*), Oesophagostomum* (23.2%), *Trichuris* (17.3%), *Mecistocirrus* (13.4%), *Nematodirus* (11. 7%), *Bunostomum* (7.0%), *Strongyloides* (5.6%), *Capillaria* (3.9%), *Trichostrongylus* (3.5%) and *Cooperia* (1.2%). Eggs of *Moniezia* were detected in 1. 7%, *Eimeria* oocysts in 59.7% and eggs of mites in 41.1% of faecal samples examined (Nakazawa, 1986).

In Combodia, prevalence and seasonal variations of helminth infections and their association with morbidity parameters were studied in traditionally reared Cambodian cattle. The overall proportion of samples that was positive for gastrointestinal nematodes was 52%, 44% and 37% in calves (from 1 to 6 months), young animals (6 to 24 months) and adults (over 24 months), respectively, while geometric mean faecal egg counts (FECs) for each of these age categories were 125, 66 and 15 eggs per gram, respectively.

The prevalence of *Fasciola* and *Paramphistomum*, estimated by coproscopical examination, varied between 5-20% and 45-95%, respectively (Dorny *et al.,* 2011).

In Germany, a survey was made know the influence of re-wetting of pastures on the occurrence of important endoparasites in cattle was monitored over the course of three years. A total of 692 samples were tested where the overall prevalence was 29.5% for *Eimeria* spp and 42.2% for nematodes (Kemper and Henze, 2009).

In Greece, a two years long study was carried out to know the GI parasitic infections in beef cattle of 15 farms in Mediterranean climate. Among a total of 262 fecal samples, 42 (16%) samples were positive where Strongyle-type eggs were found in 28 (10.7%) samples, *Strongyloides* spp and *Toxocara* spp eggs in 8 (3.1%) samples and *Capillaria* spp and *Moniezia* spp eggs in 1 (0.4%) sample followed by Coccidian oocysts were found in 123 (46.9%) samples. It was also revealed that a four-fold increase in the risk of coccidian infections in calves less than 12 months old compared with animals that were more than 36 months old (Theodoropoulos *et al.,* 2010).

In Ethiopia, an epidemiological investigation in western Oromia region was conducted to determine the prevalence and risk factors associated with gastrointestinal parasitism. The investigation showed that the overall prevalence of gastrointestinal parasites was 69.6% with 50.2%, 75.3%, and 84.1% in cattle, sheep, and goats, respectively. Strongyles and Eimeria were the most prevalent parasites encountered. Most of the cattle (44.4%), sheep (45.1%) and goats (47.8%) were infected by single parasite while the remaining 5.8%, 30.2%, and 35.3%, respectively, were infected by 2 and more than 2 types of parasites, where most of the combinations were *Strongyles* and *Eimeria* (Regassa *et al.,* 2006).

In Tanzania, a survey was conducted to know the prevalence of GI parasitic infection in grazing Maasai cattle in pastoral farming area where Coccidian oocyst, nematodes and trematodes infections were found in 2.2%, 20% and 56.6% in cattle, respectively. The overall prevalence was estimated to be 47% (Swai *et al.,* 2006). However an abattoir survey showed that the infection rate of *Schistosoma bovis* was estimated a 31 % (Masaba *et al.,* 1977).

In Algeria, a total of 222 calves varying of 1 to 18 months of age were examined to evaluate the prevalence of gastrointestinal helminthiasis of calves. The prevalence of eggs

of Strongyloidea, *Trichuris* spp, *Moniezia* spp, *Strongyloides papillosus* and Coccidial oocysts were, in properties and calves: 100 and 66, 100 and 57.8, 50 and 8.2, 25 and 1.8, and 33.3 and 7.8%, respectively. Of the 66 for eggs of the Strongyloidea, 64 were attributed to *Haemonchus* spp and 53.75% to *Cooperia* spp (Repossi *et al.,* 2006).

In Mali, post-mortem inspections on 51 calves were conducted to investigate acquisition and spectrum of gastrointestinal parasites in young calves in periurban livestock production. It was observed that parasite number and burden increased with age. In the age class 4-13 months animals carried already up to eight different gastrointestinal parasite species. The most frequent parasite species found were *Haemonchus placei* (age class 0-1 month: 7%, 1-4 months: 38%, 4-13 months: 69%), *Cooperia pectinata* (0%, 33% and 44%) and *C. punctata* (0%, 33% and 38%). Calves born during the rainy season had higher parasite burden and species diversity than calves born during the dry season (Wymann *et al.,* 2007).

In Costa Rica, a longitudinal survey was carried out to determine, describe the prevalence and intensity of gastrointestinal parasite infections in two different ecological zones. The most prevalent gastrointestinal parasites detected on both farms (dairy cattle, A, beef cattle, B) were *Eimeria* spp (94.7%, 93.7%), Strongylidae (75.0%, 81.4%), *Buxtonella sulcata* (38.0%, 21.6%) and *Strongyloides papillosus* (29.8%, 31.7%), whereas *Moniezia benedeni* (4.8%, 9.1%), *Trichuris* spp (7.3%, 13.2%), *Toxocara vitulorum* (0.0%, 1.8%) and *Entamoeba bovis* (2.5%, 1.1%) were less prevalent (Jiméneza *et al.,* 2007).

In Zimbabwe, in the highveld and lowveld communal grazing areas, an epidemiological investigation was conducted to find out the prevalence of gastrointestinal nematodes, cestodes, coccidia infection in cattle. Faecal egg and oocyst counts showed an overall prevalence of GI nematodes of 43%, coccidia 19.8% and cestodes 4.8%. It was also observed higher prevalence of infection with GI nematodes, cestodes and coccidia was recorded in calves than in adults. Pregnant and lactating cows had significantly higher prevalence than bulls, oxen and dry cows (Pfukenyi *et al.,* 2007). In another investigation, it was revealed that the most prevalent species were *Cooperia* spp (35%) followed by *Haemonchus* spp (18%), *Oesophagostomum* spp (11.1%) and *Strongyloides papillosus* (3%) (Vassilev, 1999). Prevalence of *Fasciola gaigantica* in slaughtered cattle was 37.1% (Pfukenyi and Mukaratirwa, 2004).

In Kenya, a study in Magadi division revealed the overall prevalence of nematodes in the calves, sheep and goats was 69.2%, 80% and 82%, respectively. The overall prevalence of Coccidial oocysts in calves, sheep and goats was 30%, 44% and 45%, respectively (Maichomo *et al.,* 2004)

In Guadeloupe, a total of 247 calves from 112 Creole cows were monitored for *Toxocara vitulorum* infection from year 2002 to 2005. The overall prevalence of infection was estimated to 0.77% (0.72, 0.83). The faecal egg count peaked 49 days after calf birth and then decreased (Mahieu and Naves, 2008).

In Brazil, 42 Holstein-zebu mixed breeding animals, 8 to 14 month old, were necropsed to examine the Helminthes parasites of cattle from Jaboticabal, São Paulo State. The prevalence and intensity of infection were as follow: *Haemonchus placei* 97,62% (1961,81), *Cooperia punctata* 92,86% (8109,45), *Oesophagostomum radiatum* 73,81% (217,38), *Trichuris discolor* 38,19% (25,48), *Trichostrongylus axei* 26,19% (122,05), *H. simillis* 21,43% (37, 45), *C. pectinata* 19,05% (198,6), *Bunostomum phlebotomum* 16,66% (8,95), *Dictyocaulus viviparus* 16,66% (3,62), *C. spatulata*14,29% (109,95), *Capillaria bovis* 11,90% (5,48), *Ostertagia ostertagi* 7,14% (0,86), *O. lyrata* 4,76% (0,17), *Eurytrema coelomaticum* 4,76% (2,14), *Moniezia benedeni*, 4.76% (0,05), *T. colubriformis* 2,38% (0,48), *Strongyloides papillosus* 2,38% (0,25). Each calf had an average worm burden of 10804 helminths, *Haemonchus* (18, 5%) and *Cooperia* (77, 91%) were the most frequently observed helminths (Borges *et al.,* 2001). In Minas Gerais state, examination of tracer calves revealed that highest worm burden occurred in rainy season. Among different parasites, *Cooperia* was most prevalent, representing 74.4% of the total of all nematodes recovered followed by *Haemonchus* spp was 19.2%, *Oesophagostomum* spp 4.5%. Infections caused by *Trichostrongylus* spp, *Trichuris* spp, and *Bunostomum* spp were less than 1% of the total (Lima, 1998). In Moto Grosso state, the common nematodes were *Cooperia* spp (71%) and *Haemonchus* spp (20%). Fecal egg counts showed two peaks, one at the beginning and other in the middle of rainy season (Melo and Bianachin, 1977).

CHAPTER-III
MATERIALS AND METHODS

3.1 Description of the study area and duration

The study was conducted three different thanas namely, Chittagong Metropolitan, Bandor, Panchlaish of Chittagong districts. The study was undertaken for a period of 6 months starting from February' 2011 to July'2011. .

3.2 Selection of animals and Survey Design

3.2.1 Target animals and age groups

Holstein Friesian (HF) crossbred cattle were selected for this study as target animals. To determine the age susceptibility to different parasites, cattle were categorized into three different sub- groups as calf (≤1 year), Young (>1 – < 2.5 years) and Adult (≥2.5years) (Sastrt *et al*., 2005).

3.2.2 Target sampling

A total of 200 fecal samples were collected randomly from 12 small or medium scale dairy farms of three different thanas of Chittagong district. Among 200 samples, 24 were calves, 76 were young and 100 were considered as adult.

A prototype questionnaire was used to record the information like owner's name and address, animal Identification (ID), farm size, breed, age, sex, deworming history. In the present study, the minimum age of the cattle was 20 days and the maximum was 144 months.

3.3 Sample collection and preservation

Faeces (approximately 5-10gm) were collected directly from rectum and stored in plastic containers. Then, the container was filled with formalin (10%) and refrigerated at 4^0C temperature. During sample collection, labeling of the samples were strictly maintained to prevent the misinterpretation.

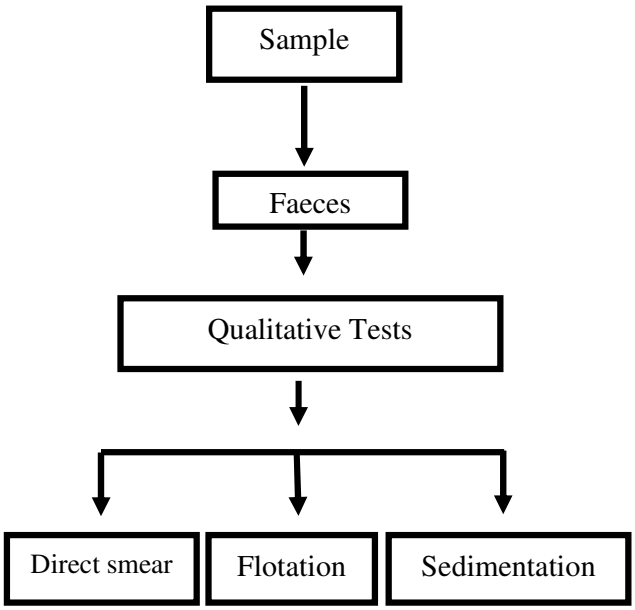
3.4 Examination of samples

3.4.1 Faecal Samples Examination

In addition to gross examination of faecal samples (color, consistency, blood or mucus, etc.), three different types of qualitative tests, namely direct smear, flotation and sedimentation techniques were used to examine the fecal samples (Hendrix, 2006). Sugar

Salt solution was used as floatation fluid. At least, two smears were prepared from each sample for each test to identify the morphological characteristics of eggs, cyst, Oocysts etc (Hendrix, 2006, Urquhart *et al.,* 1996 and Soulsby, 1982).

3.5 Experimental Design (at a glance)



3.6 Statistical Analysis

The obtained information was imported, stored and coded accordingly using Microsoft Excel-2003 to STATA/IC-11.0 (Stata Corporation College Station) for analysis. Descriptive statistics was expressed as proportion with Confidence Interval. The result were expressed in percentage with P-value for Chi-Square Test. Significance was determined when $P<0.05$.

CHAPTER-IV

RESULTS

4.1 Prevalence of gastrointestinal parasitic infections

4.1.1 Overall prevalence of gastrointestinal parasitic infections

During the current investigation, an approach was taken to determine the status of gastrointestinal parasitic infections in crossbred cattle. It was revealed 7 helminths species as 1 Cestodes, 2 Trematodes and 3 species of Nematodes in cattle population. The overall prevalence of gastrointestinal parasitic infections (either single or mixed infections) was 24.06% in study population.

Table 1: Overall prevalence of gastrointestinal parasitic infections in crossbred cattle

Gastrointestinal Parasitic infections	Percentage %	95% Confidence Interval
Fasciola spp	8.00	4.20-11.79
Paramphistomum spp	7.53	3.83-11.24
Toxocara spp	4.52	1.61-7.43
Trichuris spp	0.50	-0.48-1.49
Strongyloides spp	0.50	-0.48-1.49
Moniezia spp	3.01	0.60-5.41

Among different gastrointestinal parasitic infections, prevalence of *Fasciola* spp infection was the highest and it was 8.00 % in study cattle. The lowest parasitic infection was recorded in *Trichuris* and *Strongyloides* spp infections (0.50%). However, slightly higher prevalence was recorded in *Parasmphistomum* spp, *Toxocara* spp, and *Moniezia* spp infections in the study population (Table 1).

4.1.2 Age specific prevalence of gastrointestinal parasitic infections

Occurrences of gastrointestinal parasitic infections were influenced by the age of animals. During this investigation, it was observed that adult and young cattle were affected more by different gastrointestinal parasitic infections. Among different parasitism, *Fasciola* spp infection was the highest (10.0%) in adult followed by young and calf. *Paramphistomum* spp infection was the highest in young (10.53%) where as *Moniezia* spp infection were more in adult cattle (3.0%). *Toxocara* spp infections were recorded highest (12.50%) in calf where as *Strongylus* spp and *Trichuris* spp were only recorded d in adult cattle of this study (Table 2).

Table 2: Age-specific prevalence of gastrointestinal parasitic infections in crossbred cattle

Gastrointestinal Parasitic infections	Calf (N=24)	Young (N=76)	Adult (N=100)	P value
Fasciola spp	4.16 (1)	6.58 (5)	10.0 (10)	0.20
Paramphistomum spp	4.17 (1)	10.53 (8)	6.0 (6)	0.42
Toxocara spp	12.50 (3)	5.26 (5)	2.0 (2)	0.21
Trichuris spp	0.0	0.0	2.0 (2)	0.36
Strongyloides spp	0.0	0.0	1.01 (1)	0.60
Moniezia spp	0.0	2.63 (2)	4.0 (4)	0.92

Significant when P<0.05, N= Total no. of population

4.1.3 Sex-specific prevalence of gastrointestinal parasitic infections

In the current study, it was exposed that female cattle showed more susceptibility to different gastrointestinal parasites than male but it was not statistically significant. However, prevalence of *Fasciola* spp infections was the highest in female crossbred cattle (9.21%). Occurrence of *Paramphistomum* spp infections (7.80%) along with *Toxocara* spp *and Moniezia* spp were found more in male cattle. *Trichuris* spp and *Strongyloides* spp infection were only recorded in female cattle of this study (Fig.1).

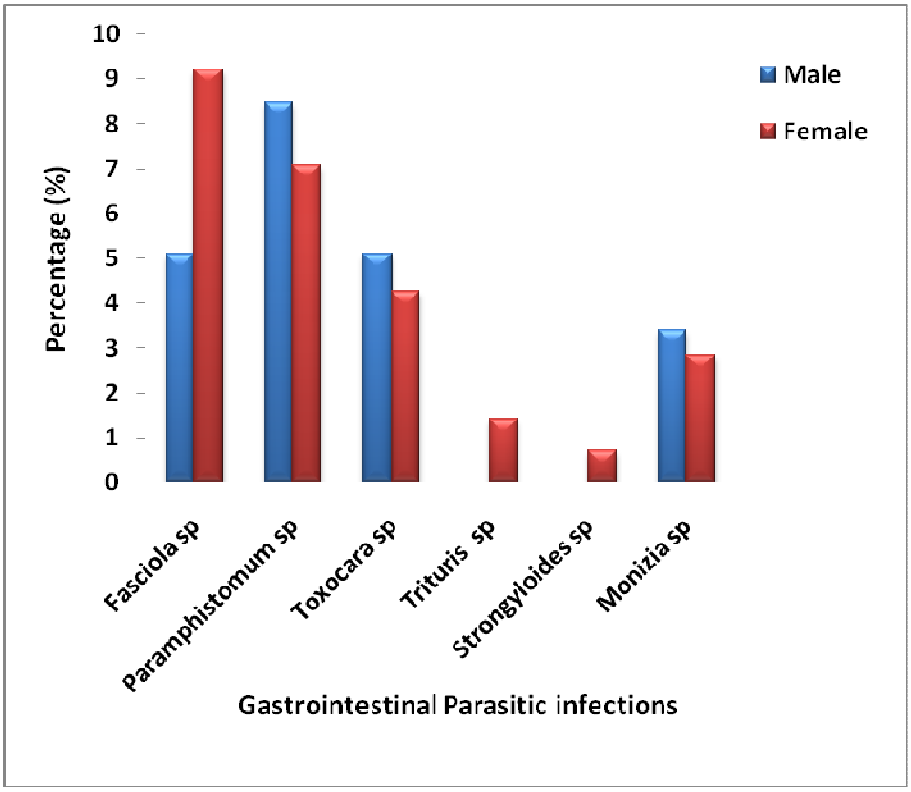
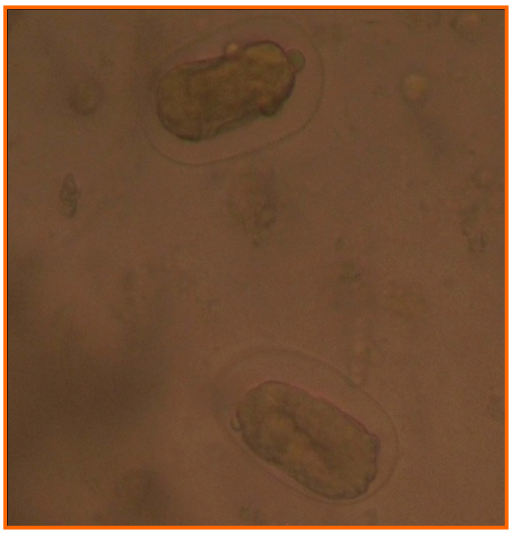


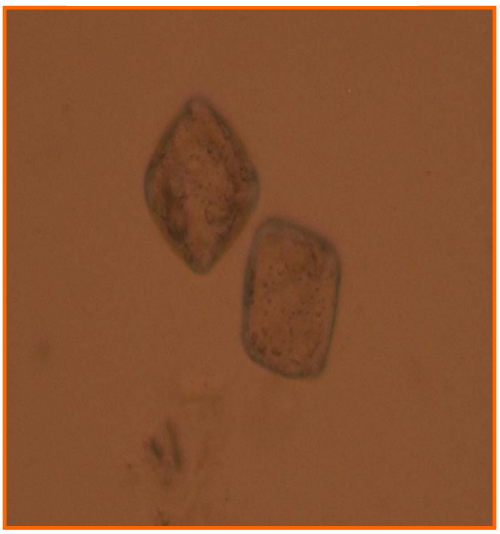
Fig 1.: Sex-specific prevalence of gastrointestinal parasitic infection in crossbred cattle

Paramphistomum cervi

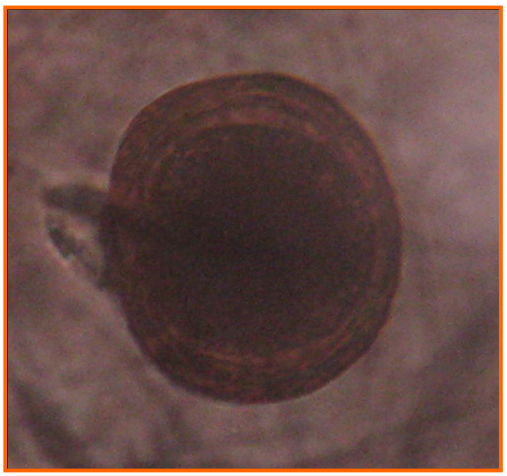
Fasciola gaigantica



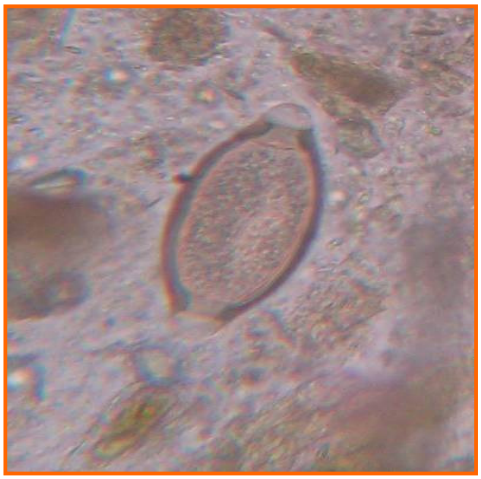
Strongyloides papillosus



Moniezia benedeni



Toxocara vitulorum



Trichuris globulosa

Fig. 2: Eggs of Gastrointestinal Parasites (during examination)

CHAPTER-V

DISCUSSION

5.1 Prevalence of gastrointestinal parasitic infections

5.1.1 Overall prevalence of gastrointestinal parasitic infections

The overall prevalence of gastrointestinal parasitic infections in crossbred cattle of this study showed somewhat similarity with the report of Khan *et al.* (2010), Saravana *et.* (2009) and Rahman and Razzak (1973) who recorded 33.68% in Pakistan, 30.0% in India and 37% in Comilla district, Bangladesh, respectively. The observation greatly varied from the report of Zahid *et al.* (2005), who recorded 39% and 38.21% in Holstein-Friesian and Jersey breed, respectively in Kasur district, Pakistan. Khan *et al.* (2010) also observed 39.82% prevalence in buffaloes in Toba Tek Singh district, Punjab, Pakistan which also showed discrepancy with the findings of this study. Variation in the occurrence of gastrointestinal parasites infection might be due to geo-climatic conditions, sample size, breed, age, sex, plane of nutrition, stress, availability of intermediate host, vegetation, grazing pattern, rearing and husbandry measures, anthelmintic therapy, genetic resistance etc. (Hansen and Perry, 1993).

Prevalence of *Fasciola* spp infection of this study was lower than the observation of Iqbal *et al.* (2007), Rahman and Razzak, (1973) and Garrels (1975) who recorded 21.42% in Pakistan and 16.30%, 22.0%, respectively in different places of Bangladesh. The observed result also varied from the findings of Alim *et al.* (2011) who recorded 2.54% and 0.92% in indigenous and crossbred cattle in different regions of Chittagong regions. Higher prevalence of *Faciola* spp might be due to geo-climatic condition (Kakar *et al*., 2008) or poor same size (Bachal, 2002).

Prevalence of *Paramphistomum* spp infection of this study was consistent with the observation of Kakar *et al.* (2008) who recorded 7.82% in Pakistan. Alim *et al.* (2011) recorded 14.81% and 12.96% of Paramphistomiasis in Holstein Friesian crossbred and indigenous cattle, respectively which was slightly similar with the findings of this study. Higher prevalence of Paramphistomiasis was recorded by Sardar *et al.,* 2006, Raza *et al.* (2009), Hirani *et al.* (2006) in different countries of the world. Lower prevalence of Paramphistomum spp infection of this study might be due to geo-climatic conditions

(Gupta *et al.,* 1987 and Georgiev *et al.,* 1980) or improved husbandry practices (Alim *et al.,* 2011).

Prevalence of *Toxocara* spp infection in cattle was found partially similar with the report of Iqbal *et al.* (2007) Akyol (1993), Chowdhury *et al.* (1993) and Alim *et al.* (2011), who reported 8.48% infection in Pakistan, 5.1% in Turkey and 6.6% and 5.55% in different areas of Bangladesh, respectively. But, the earlier findings varied widely from the reports of Avicoglu and Balkaya (2011), Sardar *et al.* (2006) and Samad *et al.* (2004), who recorded 22.2% infection in Turkey, 17.22% (native), 21.67% (cross) and 14% in Mymensingh district, Bangladesh, respectively. Conversely, lower prevalence of *Toxocara* spp infection was observed by Saravanana *et al.* (2009), Mahieu and Naves (2008), Lay *et al.* (2008) and Jiméneza *et al.* (2007) who observed 1.4% in India, 0.77% in calves in Guadeloupe, 2.3% in Myanmar and 0.0% (dairy cattle), 1.8% (beef cattle) in Costa Rica, respectively. Variation of prevalence might be due to geo-climatic diversity, animal enterprises, husbandry measures, nutritional status, deworming etc. (Hansen and Perry, 1993).

Prevalence of *Trichuris* spp infection of this study was consistent with the findings of Saravanana *et al.* (2009) and Lima (1998) who recorded 1.9% in Namakkal, India and less than 1% in Minas Gerais State, Brazil, respectively. Higher prevalence of *Trichuris* spp infection was recorded by Shirale *et al.* (2008), Jiméneza *et al.* (2007) and Sardar *et al*. (2006) in different corners of the world. Variation in the occurrence of *Trichuris* spp infection in this study might be due to geo-climatic conditions of the study areas as well as husbandry practices.

Prevalence of *Strongyloides* spp infection of this study was found consistent with the report of Alim *et al.* (2011) who recorded 1.38% in Holstein Friesian crossbred cattle of Chittagong division.

Prevalence of *Strongyloides* spp infection found in accordance with the observation of Alim *et al.* (2011), Sardar *et al.* (2006) and Garrels (1975), who recorded 1.38% in Chittagong division, 1% infection in Mymensingh and 1.6% in Tangail, Bangladesh, respectively. Occurrence of *Strongyloides* spp of this study showed higher variation from the reports of Shirale *et al.* (2008) and Chavhan *et al.* (2008), Nakazawa (1986), Chowdhury *et al.* (1993) and Rahman and Razzak (1973), who recorded 11.14% in Akola

district, India and 11.98% in Nagpur India, 5.6% in Hokkaido, Japan, 7.4% in Savar and 8.89% in Comilla district, Bangladesh, respectively. Variation in occurrence of such infection in cattle might be due to geo-climatic condition (Kakar *et al*., 2008) or poor same size (Bachal, 2002).

Occurrence of *Moniezia* spp infection was found in accordance with the reports of Saravanana *et al.* (2009), Samad *et al.* (2004) and Yldrm *et al.* (2000), who observed 1% in India, Mymensingh district, Bangladesh and Turkey. Nakazawa (1986) observed 1.7% infection in Hokkaido, Japan and Theodoropoulos *et al.* (2010) observed 0.4% in Greece which also supported the findings of this study. Prevalence of *Moniezia* spp infection differed from the reports of Shirale *et al.* (2008), Sardar *et al.* (2006) and Borges *et al.* (2001), who recorded 4.18% in Akola district, India, 8.33% (native), 9.44% (cross) in Mymensingh district, Bangladesh and 4.46% in Jaboticabal, São Paulo State, Brazil, respectively.

Occurrence of *Moniezia* spp infection was found in accordance with the reports of Shirale *et al.* (2008) and Borges *et al.* (2001) and who recorded 4.18% and 4.46% in Akola district, India and in Jaboticabal, São Paulo State, Brazil, respectively. Slightly higher prevalence of such infection was recorded by Sardar *et al.* (2006) who documented 8.33% (native), 9.44% (cross) in Mymensingh district, Bangladesh. Lower prevalence of *Moniezia* spp might be due to less dissemination of eggs in the faces from the gravid segments (Radostits *et al.,* 1994).

5.1.2 Age specific prevalence of gastrointestinal parasitic infections

In current study, influences of age on the occurrence of gastrointestinal parasitic diseases were observed. The frequency of GI parasitic infections especially, *Fasciola* spp, Trichuris spp and Moniezia spp were found more in adult cattle than young and calf. Higher prevalence of gastrointestinal parasitic infections in adult cattle of this study showed consistency with the observation of Sardar *et al.* (2006), who reported that *Fasciola, Paramphistomum, Trichuris* and *Schistosoma* were highest in the age group greater than 36 months and lowest in age group less than 12 months. Fritsche *et al.* (1993) also observed older animals bear high worm burden than other. Prevaelcen of *Paramphistomum* spp were found more in young cattle which was similar with the observation of Reza *et al.* (2007) Regassa *et al*. (2006) Shah-Fischer (1989) and Dunn

(1978), who recorded significantly higher prevalence of helminths in younger animals than adult. In this study, 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 supply inadequate feed against their high demand. The Occurrence of *Toxocara* spp infection was highest in calf which was supported by the reports of Lay *et al.* (2008), Sarder *et al.* (2006), Aydin *et al.* (2006) and Bachal *et al.* (2002), who recorded the infection in early months of life. Higher prevalence might be due to prenatal infection through transfer of 3rd larval stage and post-natal infection by poor hygienic condition (Lay *et al.,* 2008, Urquhart *et al.,* 1996 and Soulsby, 1982).

5.1.3 Sex-specific prevalence of gastrointestinal parasitic infections

In the present study, infection caused by *Fasciola* spp, *Trichuris* spp *Strongyloides* spp, were found predominant in female than male cattle. Findings of this study was found in accordance with the reports of Davila *et al*. (2010), Raza *et al.* (2010) and Al-Shaibani *et al.* (2008) who also reported higher prevalence of helminths in female cattle. On other hand, *Toxocara* spp infection e was more in male than female cattle which was found in accordance with the reports of Rekwot and Ogunsusi (1985) and Soulsby (1982). In this study, variation in occurrence of such helminths in male and female animals might be due to the variation in sample size (Bachal *et al.,* 2002), lowered resistance of female animals or on the part of their reproductive events or temporary loss of acquired immunity near parturition (Garcia *et al.,* 2007 and Barger, 1993), stress, genetic resistance of host and insufficient/imbalanced feed against higher needs (Raza *et al.,* 2010 and Hansen and Perry, 1993).

CHAPTER-VI
CONCLUSION

The study was performed aiming to determine the prevalence of gastrointestinal parasitic diseases in crossbred cattle. The study revealed comparatively higher prevalence of *Fasciola* spp, *Paramphistomum* spp and *Toxocara* spp in cattle in relation to age and ses. The occurrence of gastrointestinal parasitic infections was observed higher in adult and female cattle. It is predicted that Gastrointestinal parasitism were more might be due to hot and humid climate which was ideally suitable for the development of such parasites. .However, poor management, insufficient diet, lack of awareness about deworming also enhances the high incidence of the infection. The study was a limited study and due to time constraints topographical variation, seasonal pattern of the diseases as well as indigenous/native cattle were not included. Hence, it can be recommended further extensive investigation on gastrointestinal parasitism to overcome the limitation of the current studies which will assist to determine the important predictors related to such diseases.

CHAPTER-VII
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