EFFICACY OF COMMONLY USED ANTHELMINTICS AND THEIR EFFECT ON BODY WEIGHT OF INDIGENOUS CATTLE AT JHIKARGACHA, JASHORE

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CERTIFICATE

This is to certify that the thesis entitled ***Efficacy of Commonly Used Anthelmintics and their effect on body weight of Indigenous Cattle at Jhikargacha, Jashore*** *submitted to the Department of Animal Production and Management, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the requirements for the degree of* ***MASTER OF SCIENCE (MS) in ANIMAL SCIENCE****, embodies the results of a piece of bona fide research work carried out by* ***ABDUR RAHMAN SHEIKH****, bearing Registration No.19-10130 under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma in any other institution.*

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

Dated: Jan-June,2021
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Dedicated To
My
Beloved Parents

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The author

LIST 0F CONTENTS

LIST OF TABLES

List of Figures

LIST OF ABBREVIATIONS AND SYMBOLS

>	=	Greater than
%	=	Percentage
<	=	Less than
BAU	=	Bangladesh Agricultural University
cm	=	Centimeter
CV %	=	Percent Coefficient of Variation
DLS	=	Department of Livestock Services
et al.,	=	And others
etc.	=	Etcetera
FAO	=	Food and Agricultural Organization
g	=	Gram (s)
Kg	=	Kilogram (s)
mg	=	Milligram
ml	=	Milliliter
MS	=	Mean Square
No.	=	Number
SAU	=	Sher-e-Bangla Agricultural University
WHO	=	World Health Organization
µg	=	Microgram

ABSTRACT

A coprological investigation was carried out to detect some variable wise prevalence of gastro- intestinal (GI) nematode infection in indigenous cattle and to know the efficacy of some commonly used anthelmintics on them. The faecal samples were collected from 112 indigenous cattle from Jhikargacha Upazilla of Jashore district with a random sampling. The study was conducted February 2020 to January 2021. Faecal sample examination of all the selected cattle showed that 29.44% (33) animals were affected with single type of GI nematode. Among them, *Toxocara vitulorum* is highly prevelant with a prevalence of 9.82%. Other species, namely *Trichuris trichiura, Bunostomum phlebotomum*, *Haemonchus contortus* and *Strongyloides papillosus* are also found significantly. Mixed infections were observed in 8.03% cattle where two or more species of nematodes are noticed. The prevalence of gastro-intestinal helminths was significantly higher in young cattle (50%) than adult (22.5%) cattle. About 33.33% male and 26.86% female cattle were infected with at least one type of gastro-intestinal nematode infestation. Both mixed and single infection was significantly higher in male cattle than those of female cattle. During summer season, prevalence is found higher (35.71%) than winter (20.51%) and rainy season (32.26%). Extensive rearing system is identified as more prevalent (34.78%) in gastro-intestnal nematodiasis than intensive (25.0%) and semi-intensive rearing system (26.31%). Cachectic animals having body condition score 1, are highly prevalent (33.33%) than others. The efficacy of Pipervet® and Almex® against Ascaris infection of were found 100% and 80% respectively whereas Levavet® and LTvet® were found 100% and 90.91% effective against single type of infection with *Trichuris trichiura, Bunostomum phlebotomum*, *Haemonchus contortus* and *Strongyloides papillosus*. The efficacy of Levavet® and LTvet® against mixed infection were 100% and 83.3% respectively . Using Pipervet®, Almex®, LTvet® and Levavet® body weight was gained after 1 month 8.88%, 10.41%, 6.57%, 6.17% respectively. These differences were not statistically significant.

CHAPTER I

Introduction

Bangladesh is an agro-based country which has a high population density. Its per capita income is very low. About 80% people of Bangladesh live in village and most of them are fully or partially depended on agriculture. Among the sub-sectors of agriculture, livestock is an important constituent of the mixed farming system practiced and this sector provides a greater contribution in Bangladesh. Livestock in Bangladesh is an essential component in crop cultivation and post-harvest operations. There are 243.91 lack cattle, 14.93 lac buffalo, 36.07 lac sheep and 264.35 lac goats in our country (Salim et al. 2020). Among all agricultural activities cattle farming occupy large area and play a vital role in the national economy. About 20% people directly and 50% people partly involved with livestock (Salim et al. 2020). Ninety percent (90%) of livestock rearingis done by the landless and marginal farmers in rural areas as their income generation. The development of livestock depends largely on its production system which is compounded by the deficiencies of feeding and breeding with further aggravates the effects of diseases and parasitic infections. Parasitism is thought to be one of the main obstacles in livestock rearing and production and subsequently in the development of livestock in our country (Jabbar MA et al. 1983). Livestock population in Bangladesh is susceptible to infection by a large number of parasites and it can be stated that very few animals are entirely free from them. Gastrointestinal nematode infection can be considered as one of the major constraints in cattle production in Bangladesh. The prevalence of parasitic infection depends directly or indirectly on several factors like species, breed, age, sex, climatic condition, nutritional status of the host in Bangladesh (Hossain MJ et al. 2004). Infections by gastrointestinal helminthes parasites of livestock are among the most common, which are considered as economically important diseases of grazing livestock (Perry et al. 2002). The economic losses due to damage by these unwanted pests are undoubtedly one of the major problems for controlling the growing livestock

industry. Assessment of losses may be based on the direct as well as indirect production losses, such as cost of controlling parasites and the cost of damage done by these parasites. The geographical condition along with the lodging of water and low laying areas, poor husbandry practices and also chronic shortage of feed predisposes to rapid multiplication and dissemination of parasites in Bangladesh. Different parasitic infections in cattle have been described from different areas of Bangladesh and have revealed that a wide variety of gastrointestinal nematodes and liver flukes are widely prevalent in Bangladesh. Gastrointestinal nematodes of ruminant include Haemonchus sp, Trichuris sp, Bunostomum sp, Oesophagostomum sp, Trichostrongylus sp etc (Hosking et al. 2008 and Samanta and Santra et al. 2009). Among the multitude of problems hindering the cattle development in Bangladesh, disease problems specially related to parasitism constitute a serious threat. Despite the special emphasis on the rearing ruminants, the development of the industry in Bangladesh is seriously threatened. 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, decrease 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 and Radostits et al. 1994). These losses caused by gastrointestinal parasites can be minimized by the prevention, control and protective treatment. Parasitism, the problems are often neglected and overlooked as majority of the infected animals show a number of little obvious clinical signs during their productive life and their effects are gradual and chronic (Raza et al. 2010).

On the other hand, large number of livestock farms has been established in government and private sector to meet up the requirement of milk and meat for a highly densely populated country like Bangladesh. Along with feed

shortage, parasitic infestations are causing main problems for proper development of these farms. But insufficient number of studies has been reported among this parasitism in cattle of Bangladesh. We can prevent and control of parasitic diseases by using a routine prophylactic anthelmintics measurement. Again, farmers of country do not have proper knowledge about anthelmintic administration. Most of the time they administer anthelmintic without knowing the efficacy and effectiveness of them. By considering the above situation, the present study is carried out in cattle of the study area to figure out the actual picture of gastro-intestinal nematodes infection in Bangladesh and testing efficacy of anthelmintic working against them. So, we can prevent and control of parasitic diseases by using a routine prophylactic anthelmintics measurement. In regard to nematode infections, several chemicals provide solely therapeutic activity wherein existing worm burdens are removed to a variable degree. Among these Albendazole (Helmex-vet®, Renata Limited), Fenbendazole (Peraclear®, Techno Drugs) and Levamisole (Ralnex®, Novartis, Bangladesh Limited) are widely used for the treatment of gastrointestinal Nematodiasis. Therefore, this study will provide an overall idea regarding the distribution of gastro-intestinal nematodes infection of the selected areas and will make consciousness to farmers for taking appropriate control measures of that parasitism.

The present study was carried out with the following objectives:

- Estimation of prevalence and risk factors of gastrointestinal nematode infestations in indigenous cattle.
- To determine the efficacy of commonly used anthelmintics.

CHAPTER II

Review of Literature

Gastrointestinal nematode (GIN) infestation is a common problem in cattle all over the world. So, this study is performed to determine the prevalence of gastrointestinal nematode infestation in indigenous cattle of particular area of Bangladesh and efficacy of some commonly used anthelmintic against them. Here some literatures are reviewed related to the present study in the following subsections.

Gastrointestinal Parasitism

The relation between two species of plants or animals, in which one benefits at the expense of the other without killing the host organism, is called parasitism. Most of theparasites live in gastrointestinal tract of host and cause loss to them. A study says thatthe prevalence of gastrointestinal parasitic infections is ranged between 1.15% to 64.4%in cattle in Bangladesh (Qadir et al. 1974) but the overall prevalence of gastrointestinal parasitic infestation was 57.14% (Kabir MH et al. 2018). Mostly, parasitic infestation rate is found high in undernourished animals (Sarker MAS et al. 2000). The endoparasitic infestation is caused mainly by nematodes (Mondal MMH et al. 1994). Various gastrointestinal (GI) nematodes infection contributing a prevalence rate of 75.46% (Ilyas N, 2016) . The results several groups of nematodes were prevalent by N. Ilyas et al. 2016 was *strongylid* spp (65.87%), *Trichuris* spp (8.76%), *Staphanofilaria* spp (5.70%), *Capillaria* spp (5.25%), *Strongyloides* spp (5.15%), *Thelazia* spp (5.08%) and *Ascaris* spp (4.32%). Again in another study by Monirul et al, 2015 *Haemonchus* spp. was found highest in 17.31%. Along with *Haemonchus* (17.31%), other infestation ratewas found in case of mixed infection (13.46%), *Trichostrongylus* (9.61%), *Oesophagostomum* (7.69%), Trichuris (5.77%) and *Bunostomum* (3.85%).

Life Cycle of Nematode

The general gastrointestinal nematodes life cycle has common stages although each species has unique variations and adaptations. GIN in cattle have a direct life cycle and are almost exclusively transmitted on pasture via oro-fecal transmission (Leathwick DM et al. 2011). Consequently, cattle on pasture are at a greater risk of parasitic infection. Adult parasites live in the GI tract of their definitive host (cattle), where they undergo sexual maturation and reproduction (Leathwick DM et al. 2011). Female adults lay eggs, which are then passed in the manure into the environment. The eggs hatch into free-living first stage larvae (L1), which moult into second stage (L2) and then into the infective third stage (L3) larvae. This maturation process can occur in as little as 10 days at an ideal environmental temperature of 25°C. The infective L3 migrate away from the fecal pat onto nearby vegetation where they are inadvertently ingested by grazing cattle (Leathwick DM et al. 2011). Once inside the host, the larvae undergo one more moult into fourth and fifth stage

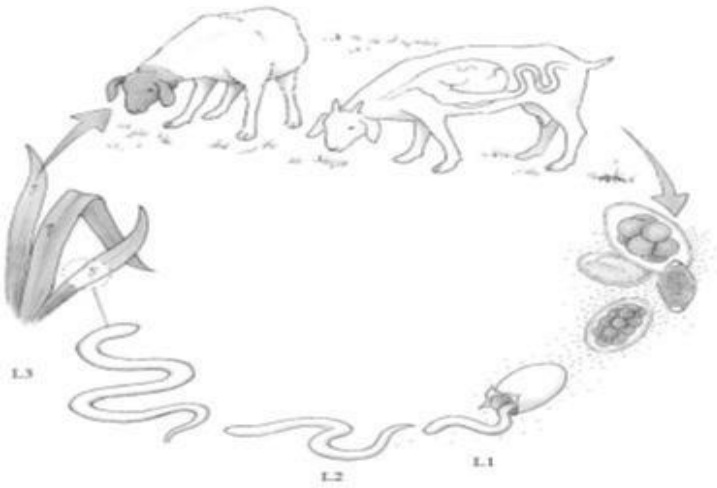

Fig. 2.2.1: Life cycle of nematode

(L4, L5) larvae that finally develop to adult worms to complete the life cycle,

which takes approximately 21 days in the host. Many nematode species become dormant (a process known as hypobiosis) over the winter months in the northern hemisphere, and cattle will not shed eggs during this period (Leathwick DM et al. 2011). It is important to note that host-parasite interactions are highly dependent on external environmental conditions (mainly temperature and moisture), which can greatly affect the population dynamics of the parasites. Although optimal larval development temperatures vary among nematode species, 25°C is the ideal temperature for the development of *O. ostertagi* larvae in the laboratory, and observed no development below 5°C (Ciordia H et al. 1963). In a field study in Argentina, *O. ostertagia* and *C. oncophora* L3 larvae survived on pasture for 12 months with a temperature low of 5°C (Fiel CA et al. 2012). Sufficient moisture allows for the survival of free-living stages of parasitic larvae in the environment, particularly in the summer months with higher ambient temperatures.

Morphology of Nematode Eggs

Without having knowledge of parasite egg morphology, it is quite difficult to identify different types of eggs as each egg has different identifying characristics.

Eggs of *Ascaria spp*.

- Typically golden brown color for mammialated eggs and clear for decorticated eggs.
- Oval shaped or slightly rounded.
- 45-75 µm × 30-50 µm
- Smooth, decorticated shell or bumpy, mammialated shell
- Shell has two layers, one thicker outer shell and one thinner inner shell
- Viable eggs have defined space between inner shell and outer shell

Eggs of *Trichuris spp.*

- Yellow to brownish with clear mucoid plugs
- Lemon shaped with curved sides and rounded mucoid plugs
- Eggs are 50-55 micrometers by 20-25 micrometers.
- No space in between inner and outer shell
- The eggs are unembryonated when passed in stool

Eggs of *Strongyloides spp.*

- The eggs are ellipsoid
- 40–85 µm in length, with a thin wall containing a larva
- The presence of larvae in fresh feces is also diagnostic of Strongyloides infection.
- The stage (eggs or larvae) present in feces is a species-specific character

Eggs of *Bunostomum spp.*

- Eggs of Bunostomum spp. are irregular and ellipsoid
- Thin shelled and have 4-8 blastomeres.
- The *eggs* are ovoid but with an irregular *shape*
- *Measure* ~55 × 95 micrometers, and contain 4 to 8 cells when shed.

Eggs of *Haemonchus spp.*

- The ova are yellowish in color.
- The egg is about 70–85 µm long by 44 µm wide, and the early stages of cleavagecontain between 16 and 32 cells.
- The adult female is 18–30 mm long and is easily recognized by its trademark"barber pole" coloration.

Risk Factors of Gastrointestinal Parasitic Infection

Risk factors are something that increases the chance of a disease. Gastrointestinal parasitic infection also has some risk factors. Higher prevalence of parasitic infectionin adult cattle might be due to keeping them for a longer period of time in breeding and milk production purposes or due to supplying inadequate feed against their high demand (Radostits O et al. 1994). Moreover, stress like lactation, pregnancy, nutritional deficiency which probably accounted for higher prevalence in adult cattle (Sardar SA et al.2006). Higher prevalence of helminthes infestation in late autumn and winter may be attributed to suitable environmental condition like optimum temperature and relative humidity (81.60%), which might be, helped for the development and survival of helminthes ova in the environment (Samaddar K et al. 2015). This variation in between the present and earlier results might be due to the differences among the geographical locations and climatic conditions of the experimental areas, method of study, sample size, breed of the animals (Samaddar K et al. 2015). Improved husbandry measures along with irregular anthelmintic or sometimes strategic anthelmintic therapy contributed less parasitic infection in crossbred cattle (Alim MA et al. 2012). Coastal areas (Noakhali and Boalkhali) were more vulnerable for gastrointestinal parasitism compared to hilly (Khagrachori) or semi-hilly (Rangunia) areas which might be due to favorable temperature and humidity that may have the influence on the survival and dissemination of eggs, larvae as well as intermediate hosts of the parasites (Alim MA et al. 2012). Again, higher prevalence of gastrointestinal parasitism was noticed in indigenous cattle due to communal grazing, insufficient diet and higher stocking density in those areas (Alim MA et al. 2012). Lower susceptibly of such infections in crossbred cattle might be due touse of irregular or strategic use of anthelmintics and improved hygienic measures at farm level (Alim MA et al. 2012). Nutritional status of cattle effects on the prevalence of zoonotic gastrointestinal parasitic infections. Parasitic infestation was higher in poor body conditioned cattle (36.3%) than that of

medium (34%) and good (22.4%) body conditioned cattle (Kabir MHB et al. 2019). One of the new variable factors, stool consistency of cattle was investigated. In this study, prevalence of gastrointestinal parasitic infections in cattle was significantly higher in cattle with diarrhea (40.8%) than non-diarrheal animal (15.1%) (Kabir MHB et al. 2019). Another variable factor is previous history of deworming animals with appropriate anthelmintic. Here, the prevalence of gastrointestinal parasitic infections was significantly (P=0.02) higher in cattle with no previous history of deworming (35.6%) than that of cattle with previoushistory of de-worming (19.4%) (Kabir MHB et al. 2019).

Age-wise Prevalence

Age of the host has an effect on the prevalence of gastrointestinal helminthes of calves as well as in adult cattle. Gastrointestinal nematodes are serious problems for ruminants, especially young animals. A report suggest that 50% cattle up to one year ofage died due to gastrointestinal parasitic infestation that cause digestive disturbances and malnutrition leading to calf mortality (Debnath NC et al. 1995)The young calves of 0-2months old are considered to be highly susceptible to nematode infection (SN, 1949). The nematode infestation such as *Ascaris, Haemonchus, Strongylus* and *Trichuris* were found of 60.80%, 2.35%, 5.19% and 1.01% in cattle at age of 0-1 year, 0.00%, 5.06%, 9.11% and 2.02% in cattle at age of 1-3 years and 0.00%, 7.42%, 10.37% and 2.95% in cattle at age of over 3 years aged (Samaddar K et al. 2015). Another study says that the proportions of Monieziasis, trichuriasis and strongyloidosis were found relatively higher in younger cattle (up to 1 year) than those in older age groups (>1 year to 2 yearsand > 2 years) which is similar to previous statement (Aktaruzzaman M et al. 2013). The infestation rates in cows, heifers and calves were 72.3 %, 75.9 % and 83.6 % respectively but there were no significant differences among these animals and the highest infestation rate was recorded in calves (83.6 %) and higher rate in heifers (75.9%) (Akter Y et al. 2011). On the other hand, Rafiqul et al reported prevalence of gastrointestinal parasites in

cattle was the highest in adults (>2 years) cattle (85.71%) followed by yearlings (6 months to 2 years) cattle (71.67%), young calves (≤ 6months) (50%) (Islam MR et al. 2014) which shows us that yearlings were 1.25 times more susceptible than calves, susceptibility of adults were 2.37 times higher than yearlings, adults were 6 times higher than calves (Islam MR et al. 2014). Yearling cattle are also foundhigher in prevalence of gastrointestinal parasites (90.8%) followed by adults (84.9%) and young calves (74.0%) which shows that yearlings and adults were 1.23 and 1.15 times more susceptible than the calves (Rashid MM et al. 2015). Beside this, another study says, the prevalence of gastrointestinal parasites in calves was found highest in above one year age (57.14 %) and lowest in below one year age (40%) (Kabir MH et al. 2018). Hazzaz et al also found relatively higher prevalence of gastrointestinal parasitic infections in adult cattle>1years (28.5%) and lower in calves (≤ 1 year) (25.4%) (KabirMHB et al. 2019). These two groups have their conflictory data which proves that age is an important factor in gastrointestinal nematode infestation.

Sex-wise Prevalence

Sex has an effect in prevalence of nematode infestation in cattle. It was reported that prevalence of parasitic infections in cattle was significantly higher in females (33.7%)than the male (19.4%) (Kabir MHB et al. 2019). In case of female, prevalence of *Strongyloides* (1.45), Strongyles *(*1.45), *Haemonchus* sp. (3.64%) and *Trichuris*sp. (2.18%) which is relatively higher than those in male with *Strongyloides* (0%), Strongyles (0%), *Haemonchus* sp. (3.03%), *Trichuris* sp. (0%) (Islam MR, 2014). Higher rate of infections was also recorded in females (87.8%) than in the males (81.7%) (Rashid MM et al. 2015). But a study stayed that *Ascaris, Haemonchus, Strongylus*and *Trichuris* were found of 19.18%, 5.22%, 8.71% and 2.45% in male respectively and 16.37%, 5.50%, 8.18% and 1.66% in female respectively (Samaddar K et al. 2015). Single infection in animals may vary in different sex groups. *Trichuris* spp were found predominant in female than male cattle (Alim MA et al. 2012) but *Toxocara* spp infection in indigenous male cattle was found in harmony (Rekwot et al. 1985).

Breed-wise Prevalence

Parasitism in different breeds varies widely. The prevalence of gastrointestinal parasites of indigenous, Sahiwal cross and Holstein Friesian cross calves was 46%, 52% and 62% respectively (Nath TC et al. 2013). A report by Hazzaz et al also consents with this statement. They found parasitic infections in cattle significantly higher in cross breed (34.1%) than indigenous cattle breeds (18.4%) (Kabir MHB et al. 2019). Cross breeds are also found higher prevalence 63.98% than local breed in another study (Gadre AS et al. 2007). But the infestation rates were 79%, 72.6% and 83.5% in Local, Shahiwal cross and Holstein Frisian cross respectively which indicates local breeds are in second highest position in GIT nematode infestation prevalence (Akter Y et al. 2011). Thus they noted highest infestation rate for Holstein Friesian cross breed followed by local and Shahiwal cross breed (Akter Yet al. 2011). On the other hand, Humayon et al found highestprevalence in Sahiwal calves (60%) whereas in Holstein Freisian calves have lower prevalence (40%) (Kabir MH et al. 2018). They found in case of Shahiwal calves, *T. trichuris* and *O. radiatum* higher in prevalence (14.29%) whereas in case of Holstein Fresian calves, the prevalence of only *O. radiatum* (11.43%) but *T. axei, S. papillosus* and *B. phlebotomum* was not prevalent (Kabir MH et al. 2018). However, Siddiki et al found *Haemoncchus sp.* (38.01%), *Trichuris sp*. (14.87%), *Strongyloides sp.* (11.98%) and mixed infection (7.43%) in red Chittagong cattle breed (Siddiki AZ et al. 2010). The nematode infestation such as *Ascaris, Haemonchus, Strongylus* and *Trichuris* were found of 18.06%, 5.34%, 8.50% and 2.11% prevalence respectively in local breed of cattle and 18.13%, 5.31%, 8.55% and 2.20% prevalence respectively in cross breed ofcattle in Rajbari which is more or less equal to each other (Samaddar K et al. 2015). Therefore, we can say that breed is also an important factor which triggers prevalence of parasitic infestation.

Season-wise Prevalence

It is manifested that climate plays an important role in the transmission of parasitic infections in animals (Moyo DZ et al. 1996). The infection rate of gastrointestinal parasitic infections was highest during post monsoon (78.80%) followed by winter (63.44%) (Gadre AS et al. 2007). Rashid et al also agreed with that statement and they reported the helminth parasitic infection higher in rainy season (54.6%) than in winter season (32.3%) (Rashid MM et al. 2015). They showed that in rainy season, the prevalence of most of the parasites namely *Haemonchus* sp., *Paramphistomum, F. gigantica*, *Moniezia* spp. and *Eimeria* sp. were greater than those in winter season (Rashid MM et al. 2015). Kanika et al did an experiment and they showed the result by months. They found parasitic infections 5.79%, 6.62%, 8.52%, 6.20%, 6.70%, 8.27%, 9.10%, 9.76%, 7.86%, 8.44%, 14.14% and 8.60% in January, February, March, April, May, June, July, August, September, October, November and December respectively where the highest prevalence of parasitic infestation was found in month of November (14.89%) and lowest in October (6.71%) (Samaddar K et al. 2015). This variation might be due to variation in the geographical location and climatic condition of the study area.

Prevalence According to Rearing System

Bangladesh is a tropical country with hot humid environment. Here most of the animals are reared in scavenging or semi-scavenging rearing system (Ilyas N et al. 2016) (Devendraet al.1970). In these types of rearing system, animals grazed on the fields and possibly this type of management practice plays a vital role for high rate of parasitic infection in animals. In Rajbari district, the nematode infestation such as *Ascaris, Haemonchus*, *Strongylus* and *Trichuris* were found of 18.03%, 5.85%, 10.03% and 2.36% prevalence respectively in open rearing system of cattle and 18.23%, 3.84%, 4.22% and 1.54% prevalence, respectively in confined rearing system (Samaddar K et al. 2015). Kabir et al also agreed with that statement and reported that the prevalence of parasitic infection was insignificantly (p=0.60) higher in cattle reared in free range system (40.00%)

than that of cattle reared in semi-intensive (28.57%) and intensive (25.51%) rearing system (Kabir MHB et al. 2019). This difference is probably due to the abundance of parasitic eggs.

Effect of Gastrointestinal Nematode Infection in Cattle

(Bisset et al. 1994) listed the principal ways in which profitability of dairy farms is reduced as a consequence of nematode parasitism. They fall into two main categories: (1) increases in the cost of production (e.g., anthelmintics, labour, drenching equipment and facilities, veterinary / consultancy costs, vehicle running costs, etc.) and; (2) decreasesin the amount of saleable product (due to mortality and reduced productivity) (Bisset et al.1994). So, the farmers of New Zealand were spending about $27.9 million/yr on anthelmintics to control helminth parasites in cattle (Bisset et al. 1994). In 1-2 year old heifers, a trial was carried out over 5 consecutive years, suggested that uncontrolled parasitism could also affect the growth rates and subsequent milk production by an average of 14 kg live weight and 11 kg milk fat, respectively (Bisset et al.1994). However, decreases in the amount of saleable products can be measured directly in terms of reductions in total carcass weight (value) produced, for a given time period (Bisset et al.1994). Because of its effects on the production of cattle, economic loss per year in Bangladesh may be explained by further study which includes mortality, morbidity and treatment cost and it would be more beneficial for the farmers (Kabir MHB et al. 2019). Themean loss of body weight due to gastrointestinal nematodiasis as recorded was 3.225 kg with a net per capita loss of 1.613 kg meat production in the infected group during the entire period of the study (12 months) (Jas R et al. 2007). Thus, gastrointestinal nematodes mainly affect the animal health as well as loss of farmers' income. To maintain the better deworming practice and control of GI infection will help for betterincome generation by the farmers (Ilangopathy M et al. 2019).

Economic Benefit of Anthelmintic Use

Based on published studies, a producer may see weaning weight benefits of 0.4 to 12 kg (0.88-26.4 lbs.) with the administration of an anthelmintic (Stuedemann J et al. 1989). Cow-calf producers theoretically get benefit from this increase in weaning weight. In addition, Larson found a difference in pregnancy rate of ivermectin treated heifers (56.4%) compared to non-treated heifers (25.6%) (Larson RL et al. 1995) and a meta- analysis of Canadian dairy cattle with parasitism, using ELISA to quantify nematode infections, reported a 0.35 kg per cow per day milk production increase with anthelmintics treatment (Vanderstichel R et al. 2013). With these improvements in reproduction and milk production, one could assume cost-benefit to anthelmintic use. An economic analysis of pharmaceutical technologies in beef production was done through Iowa State University, showed the impact of completely removing anthelmintics from modern production systems. This study only considered the impacton pregnancy rate and weaning weight, assuming calves are weaned at the same time and sold at weaning. Potential value in different vaccination programs was not incorporated in the analysis. Results suggested an added cost of $165.47 (2006 US$) per head, with the removal of internal parasite control programs in a cow-calf operation (Lawrence JD et al. 2007). Another study, based on 2005 market prices in the U.S., suggested an increased production cost of $190 per head (Edmond MD et al. 2010). These are substantial costs for a cow-calf producer. According to Agriculture and Agri-food Canada, to put this in perspective, the average price for a 227-273 kg (501-600 lbs.) steer calf in Ontario in 2005 was $118.10 per hundred weight compared to $238.81 per hundred weight in 2014. This suggests that the previously estimated costs of removing anthelmintic from cow-calf production were an underestimate given the current value of cattle. The body of evidence from these studies strongly suggests that routine anthelmintic use has a clear beneficial effect on the health and productivity of calves and adult cattle. Discontinuation of the use of anthelmintics would likely result in economic loss.

Efficacy of Anthelmentics

Efficacy can be defined as a quantitative measure of the effectiveness of a drug which is intended to produce a desired effect. The efficacy of different anthelmintics was recorded on the basis of fecal egg count of the treated cattle (Islam MM et al. 2015). A fully effective anthemintic is expected to reduce fecal eggs count to zero after administration of the anthelmintic.

Albendazole

The efficacy of Albendazole (Helmex-vet®) was 93.58% in a study (Islam MM, 2015). But some earlier workers reported 100% efficacy of Albendazole against gastro-intestinal nematodiasis (Demeler J et al. 2009). The efficacy of combined treatment with clorsulon-albendazole in cattle, and observed 99% efficacy against mature flukes and 91% against immature stages (Kilgore RL et al. 1985). As per these statements, we can say,it is one of the best anthelmintic.

Levamisole

Levamisole has also been extensively tested against gastrointestinal nematodiasis in cattle showing efficacy over 90% (Bogan J et al. 1987). Monirul et al found the efficacy of Levamisole (Ralnex®) 93.93% against gastrointestinal nematodiasis which correlates with the previous statement (Islam MM et al. 2015). Again 97 to 100% efficacy of levamisole was found against the major nematode species encountered in another trial in 2001 (Velarde FI et al. 2001). More studies needed to comment on efficacy of levamisole along with combination with other anthelmintic.

Piperazine Citrate

The average EPG count in piperazine treated group showed considerable reduction by 49.06% on 3rd day of post-treatment and by 7th day all the animals were free from ascaroids ova (Bhattacharyya et al. 2009). However, more studies require making concerete comment on it.

Effect of anthelmintics on body weight of cattle

The body weight of gastrointestinal nematodes infested cattle were increased ($p<0.01$) after treatment with different anthelmintics on 30th days. It might be due to proper digestion, absorption and metabolism of feed nutrient because of absence of gastrointestinal nematodes infection. Some workers found earlier improvement in body weight after treatment with anthelmintics (Hayet et al., 1985; Rajangam and Balachandran, 1989; Taylor et al., 1995; Ryan et al., 1997; Fornieles et al., 2000; Kaminsky et al., 2008; Kuzmina and Kharchenko 2008). These results, in retarded growth, reduced productivity and increased susceptibility to other infections without been noticed, and this was very important from an economic point of view. Managements, especially feeding system and age were found to be important risk factors in the incidence of nematode in cattle. Thus, alternatively uses of different antihelminthes for strategic deworming to treat clinical and subclinical cases, indoor feeding, rotational grazing with further study on the impact of nematodes on growth rate and production performance of dairy animal were recommended (Adem et al., 2011).

CHAPTER III

MATERIALS AND METHODS

Study Areas and Population

The study was carried out in 47 small holder dairy farms of different villages of Jhikargacha Upazila. It is one of the biggest upazila in Bangladesh consist 11 unionsand 1 municipal. All the cattle (n=112) in these farms were included in this study. Thes study was carried out from February 2020 to January 2021.

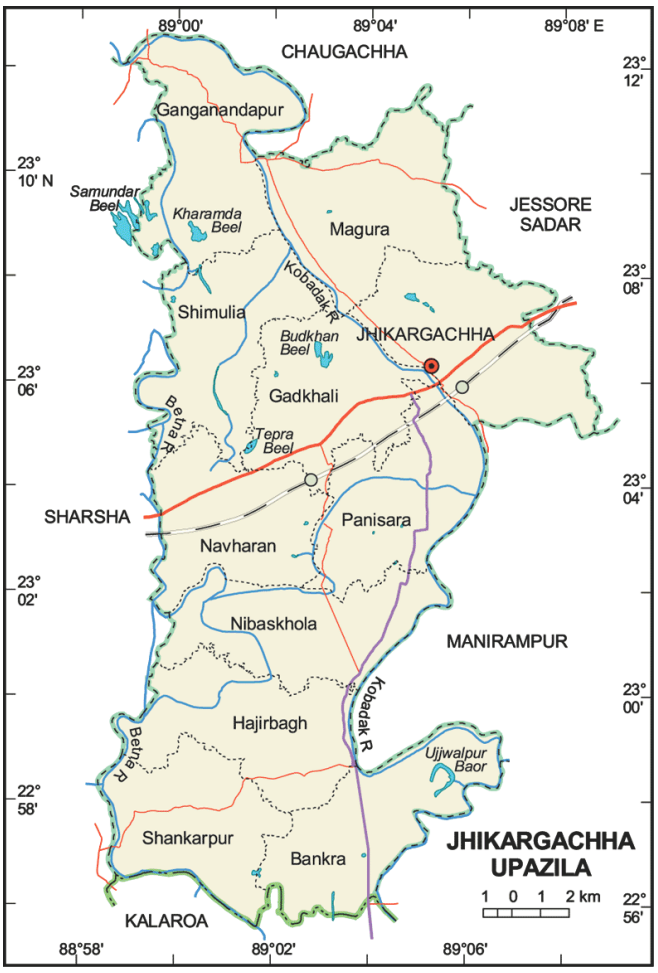

Fig. 3.1: Map of Jhikargacha upazila

Data Collection

Data on farm location, address, age, sex, breed, BCS, body weight of the cattle and history of the anthelmintics treatment, management history were collected by using a structured questionnaire.

Questionnaire

Date: Group: A/B Form No. :

1. Owner's address:

Name: …… Mobile No. :...……...…...…

Total number of animal: ……..… Village:

…….……

Union:.....Upazilla: Jhikargacha, District: Jashore

2. Animal description:

Species: Bovine, Breed: Indigenous/ Exotic/ Cross, Sex: Male/ Female, Age.....,

Tag No. : …….……, Weight: …….……, BCS:.....

Pregnancy status……., Milk production per day: …….,

Last calving date: ….

……. Calf age: ……..….

3. Disease history:

Duration of illness: …… Lessons:

.……

……..……

Previous treatment:

…..……

4. Anthelmintic history:

Previous date of administration of anthelmintic:

..…….....

If yes, then name of the anthelmintic:

.……

Willingness to feed after anthelmintic administration: Decrease/ As usual/ Increase

5. Management history:

Management system:

Intensive/ Semi-intensive/ Semi-extensive/Extensive

Feeding history: ……..

Food items: ……..

Source of water supply:

House is made of: Concrete/ Mud/ Bamboo/ Other

……

……..

6. Sample identification and record keeping:

Name of the parasite found: ……..

Parasite load per slide:

Heavy (30<)

Moderate (10-30):

Low (10>):

7. Providing anthelmintic with trade name:

……

8. Parasite load after 14 days of anthelmintic treatment: Heavy/ Moderate/ Low/ Nil

9. Body weight after anthemintics administration: …….

Group A= Cattle infected with Ascariasis , Group B= Cattle infected with other nematodes

Experimental Design

This study was carried out with the following procedure.

Planning and selection of research area

↓

Selection of animals

↓

Collection of feces and recording of relevant data

↓

Preservation of feces in 10% formalin

↓

Examination of feces using Stoll's ova counting technique

↓

Identification of parasitic ova

↓

Statistical analysis of research findings and collected data

Figure-2: Flow chart showing research outline

Collection of Fecal Samples

Fecal samples (5gm/cattle) were collected directly from the rectum, sometimes from early morning feces of the study cattle before the use of any anthelmintics. However, cattle those were positive for any helminthes infection was further subjected for sampling of feces two weeks after anthelmintic treatment. Fecal samples of individual animals were collected and taken into small polyethylene bag. About 5 grams of feces were collected from each animal and were brought to the Upazila Livestock Office laboratory for examination.

Examination of Fecal Sample

Total egg per gram (EPG) of feces of all the animals was counted by Modified Stoll's Dilution Method (Soulsby et al. 1986). For this purpose, 3 grams of feces was thoroughly mixed with 42 ml of 0.9% sodium hydroxide solution. Then 0.15 ml was taken in a graduated pipette and transferred into a glass slide and covered with 22×46 mm cover slide. Ova were counted with 10X objectives. The worms were identified on the basis of the morphology of the egg. Number of ova counted was multiplied by calibration factor 100.

Brief Description of the Methods of EPG Counts

The eggs were identified on the basis of their morphology. The risk of misinterpretation with foreign materials such as pollen grains, accidentally formed air bubbles, plant cells etc. was avoided carefully. Samples showing negative results at direct smear were further examined by floatation and/or sedimentation technique using saturated salt solution. Absence of parasitic egg in concentrated from was finally regarded as negative. Fecal egg counts were done by Modified Stoll's Dilution technique (Soulsbyet et al. 1986)

Anthelmintic Trail against Infestation

Animals infected with nematodes were treated by total four anthelmintics as listedbelow:

Group A: Animals treated with Pipervet® (Piperzine citrate) and Almex® (Albendazole) – infected by Ascariasis.

Group B: Animals treated with Levavet® (Levamisole) and LT vet® (Levamisole HCl

+ Triclabendazole) – infected by *Trichuris spp. , Strongyloides spp. , Haemonchus spp., Bunostomum spp.*

Animals infected with mixed infestation like *Toxocara vitulorum* + *Trichuris spp.*+*Strongyloides spp* , *Trichuris spp.*+ *Strongyloides spp.* , *Trichuris spp.*+*Strongyloides spp* + *Haemonchus spp.* , *Bunostomum spp.* were treated by two groups by two anthelmintics namely Levavet® (Levamisole) and LT vet® (LevamisoleHCl + Triclabendazole).

The anthelmintics efficacy of the used drugs was evaluated on the basis of fecal egg count per gram of faces pre and post treatment of the animal.

Statistical Analysis

The T-test for proportions was done to find out the significant differences in the prevalence of helminthes infection in terms of age, sex, season, management system and BCS of the cattle.

CHAPTER IV

RESULT AND DISCUSSION

Prevalence of Gastrointestinal Parasitic Infections inCattle

During the study period 112 cattle were examined through fecal sample examination in which 33 samples were found positive infected with different species of gastrointestinal nematode with an overall prevalence 29.44%. The helminthes identified were different nematodes, namely, *Toxocara vitulorum* (9.82%), *Trichuris trichiura* (5.35%), *Bunostomum phlebotomum* (2.67%), *Haemonchus contortus* (6.25%) and *Strongyloides papillosus* (5.35%). From this study, it was observed that the prevalenceof *Toxocara vitulorum* (9.82%) was the highest whereas *Haemonchus contortus* (6.25%) infections were the lowest (Table 4.1). Mixed infection was found with a prevalence of 8.03%. (Table 4.2)

Age Related Prevalence of Gastrointestinal Nematode Infestation in Cattle

Age of the host had an effect on the prevalence of gastrointestinal nematode infection in cattle. In this study, it was observed that prevalence of gastrointestinal parasitic infections in cattle was relatively higher in calves <1years (50%) and lower in adult cattle >1 year (22.50%). Calves were 2.22 times more susceptible than adult cattle. Prevalence of nematodes were the highest in calves <1year respectively *Toxocara vitulorum* (36.67%), *Trichuris trichiura (6.67%)*, *Bunostomum phlebotomum* (0%), *Haemonchus contortus* (3.33%) and *Strongyloides papillosus* (3.33%) whereas the lowest infection were in adult cattle >1year respectively *Toxocara vitulorum* (0%), *Trichuris trichiura (4.87%)*, *Bunostomum phlebotomum* (3.65%), *Haemonchus contortus* (7.31%) and *Strongyloides papillosus* (6.07%). (Table 4.3)

Sex Related Prevalence of Gastrointestinal Parasitic Infections in Cattle

In this study, it was recorded that prevalence of gastrointestinal parasitic infections in cattle was significantly higher in males (33.33%) than the female (26.86%) cattle. Female cattle were 1.24 times more susceptible than male. In males, prevalence was higher in case of *Toxocara vitulorum* (8.89%), followed by that of *Trichuris trichiura (6.67%)*, *Bunostomum phlebotomum* (4.44%), *Haemonchus contortus* (6.67%) and *Strongyloides papillosus* (6.67%). In female, prevalence was higher in case of *Toxocaravitulorum* (10.45%) followed by *Trichuris trichiura (4.47%)*, *Bunostomum phlebotomum* (1.49%), *Haemonchus contortus* (5.97%) and *Strongyloides papillosus* (4.47%). (Table 4.4)

Prevalence of Gastrointestinal Nematode According to Body Condition Score

In this study, it was observed that prevalence of gastrointestinal nematode infections were significantly higher in poor body conditioned cattle, having BCS 1 (33.33%) thancattle having BCS 2 (27.91%) and cattle having BCS 3 (25.80%). Poor body conditioned cattle were 1.19 and 1. 29 times more susceptible than medium and normalbody conditioned cattle, respectively. (Table 4.7)

Management System Related Prevalence of Gastrointestinal Parasitic Infections in Cattle

Management system had a profound effect on the prevalence of gastrointestinal parasitic infections in cattle. During this study, it was observed that the prevalence of gastrointestinal parasites were significantly higher in cattle reared in extensive system (34.78%) than that of cattle reared in intensive (25%) and semi-intensive rearing system (26.31%). Cattle reared in extensive system were 1.39 and 1.32 times more susceptiblethan cattle reared in intensive and semi-intensive rearing system respectively. (Table 4.6)

Seasonal Prevalence of Gastrointestinal Parasitic Infection in Cattle

Prevalence of gastrointestinal parasitic infections was higher in summer (35.71%) and lowest in winter season (20.51%). In summer season, cattle were 1.74 and 1.10 times more susceptible than winter season and rainy season respectively. The highest rate ofinfection was found with *Haemonchus contortus* (11.90%) followed by *Trichuris trichiura (7.14%)*, *Bunostomum phlebotomum* (0%), *Toxocara vitulorum* (9.52%) and *Strongyloides papillosus* (7.14%) infection in summer. The lowest rate of infection was recorded with *Toxocara vitulorum* (10.26%) followed by *Trichuris trichiura (2.56%)*, *Bunostomum phlebotomum* (2.56%), *Haemonchus contortus* (0%) and *Strongyloides papillosus* (5.13%) infection in winter. Infestation rate of *Toxocara vitulorum, Trichuris trichiura, Strongyloides papillosus*, *Bunostomum phlebotomum and Haemonchus contortus* were 9.67%, 6.45%, 3.23%, 6.45%, 6.45% respectively in rainy season. (Table 4.5)

Efficacy of Anthelmintics

The results of anthelmintics efficacy against infections are presented in Table 4.8. The efficacy of Almex® and Pipervet® against infection of Ascariasis was 80% and 100% respectively. Levavet® was found 100% effective against hook worm, stomach worm, Strongyloidosis and *Trichuris* infection whereas LT vet® was found 90.91% effective against hook worm, stomach worm, Strongyloidosis and Trichuris infection. The efficacy of Levavet® and LT vet® against mixed infection were 100% and 83.3%, respectively.

Table 4.1 Prevalence of gastrointestinal nematode infestation inJhikargacha

Name of the nematode	No. of cattle infected (n=112)	Prevalence (%)
Toxocara vitulorum	11	9.82
Trichuris trichiura	6	5.35
Strongyloides papillosus	6	5.35
Bunostomum phlebotomum	3	2.67
Haemonchus contortus	7	6.25
Total	33	29.44

n = Total number of cattle examined from the figure it can be seen.

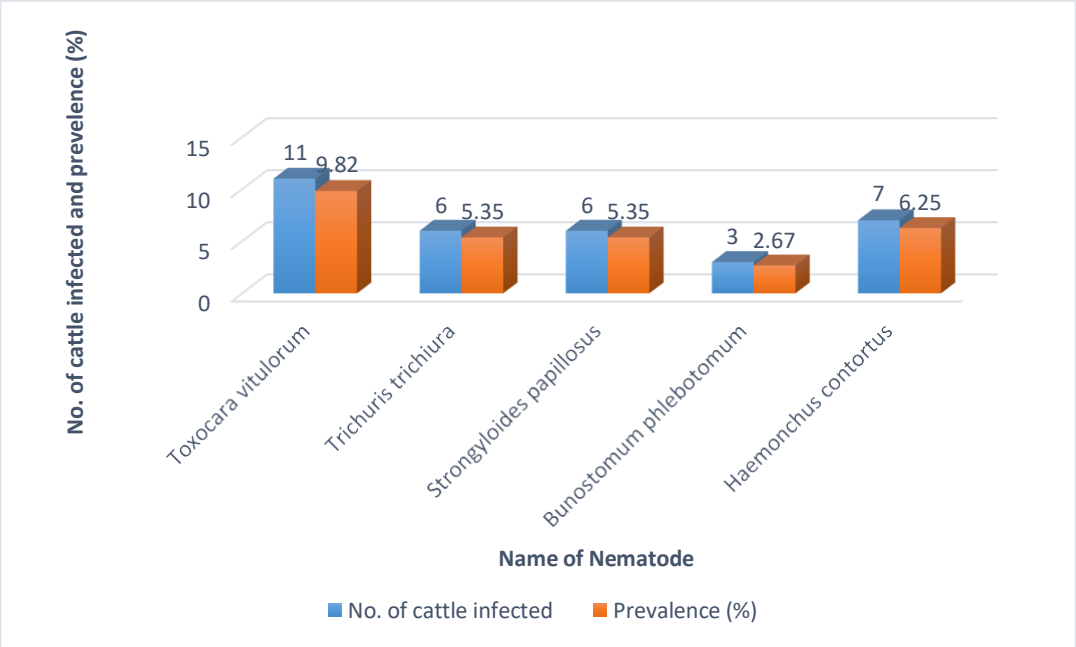

Figure 4.1 Prevalence of gastrointestinal nematode infestation in Jhikargacha

Table 4.2 Prevalence of mixed gastrointestinal nematode infestations

Name of parasites		No. of cattle infected (n=112)	valence (%)
Mixed infection	*Toxocara vitulorum* +*Trichuris trichiura* + *Strongyloides papillosus*	3	2.67
	Trichuris trichiura + *Strongyloides papillosus*	2	1.78
	Trichuris trichiura + *Strongyloides papillosus* + *Haemonchus contortus*	4	3.57
Total		9	8.03

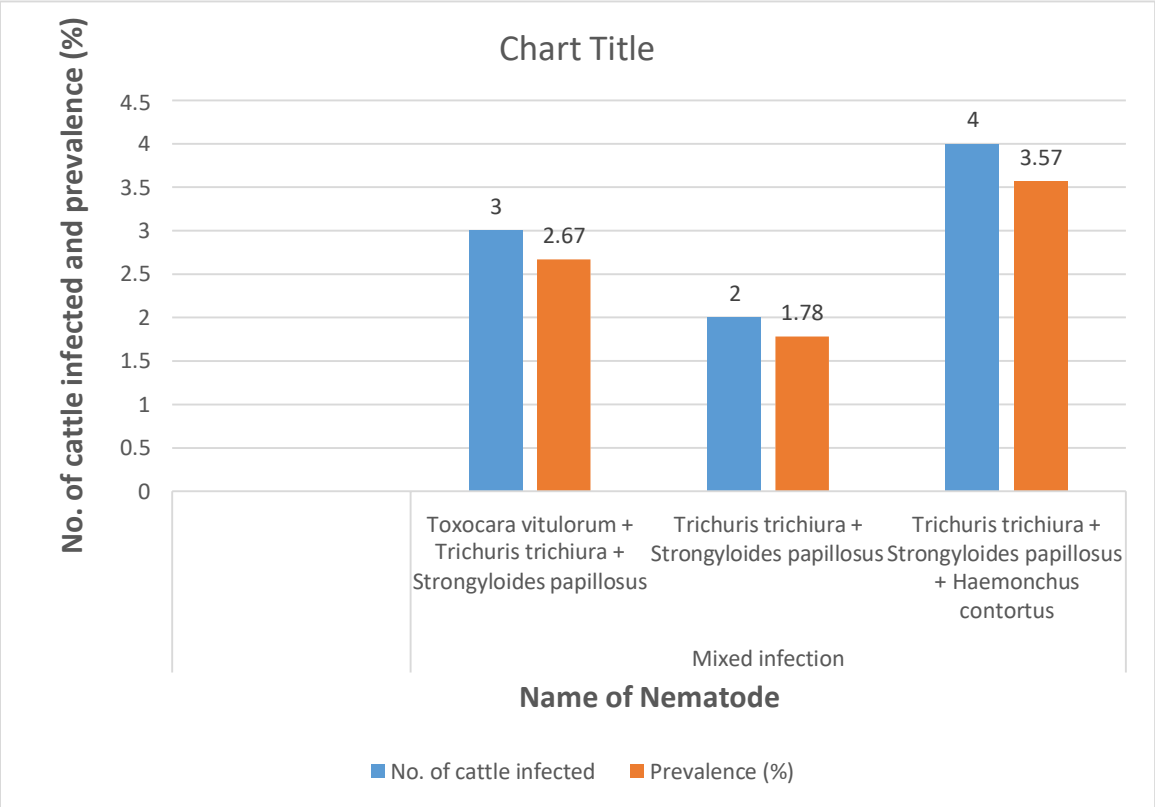

Figure 4.2 Prevalence of mixed gastrointestinal nematode infestations

Table 4.3. Prevalence of gastrointestinal nematode infestations according to age

Name of the nematode	Age	
	<1 year (30)	**>1 year (82)**
Toxocara vitulorum	11 (36.66)**	0 (0)
Trichuris trichiura	2 (6.67)	4 (4.87)
Strongyloides papillosus	1 (3.33)	5 (6.09)
Bunostomum phlebotomum	0 (0)	3 (3.65)
Haemonchus contortus	1 (3.33)	6 (7.31)*
Total	15 (50%)	18 (22.50%)

*Significant at p<0.05, **Significant at p<0.01,

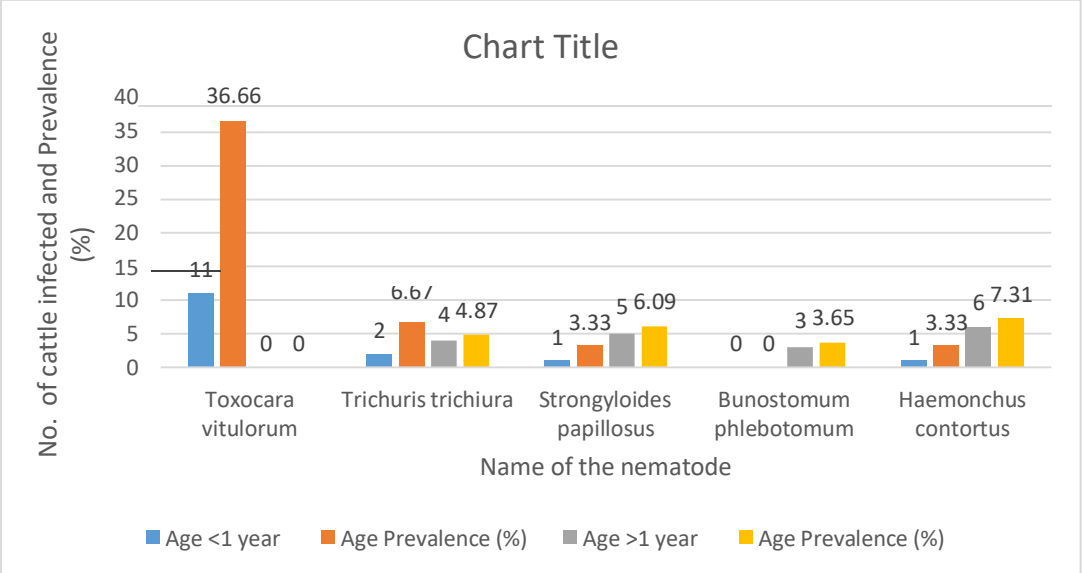

Figure 4.3. Prevalence of gastrointestinal nematode infestations according to age

Table 4.4 Prevalence of gastrointestinal nematode infestations according to sex

Name of the nematode	Sex	
	No. (%) of affected male cattle (n=45)	No. (%) of affected femalecattle (n=67)
Toxocara vitulorum	4 (8.89)*	7 (10.45)**
Trichuris trichiura	3 (6.67)	3 (4.47)
Strongyloides papillosus	3 (6.67)	3 (4.47)
Bunostomum phlebotomum	2 (4.44)	1 (1.49)
Haemonchus contortus	3 (6.67)	4 (5.97)
Total	15 (33.33%)	18 (26.86%)

*Significant at p<0.05, **Significant at p<0.01,

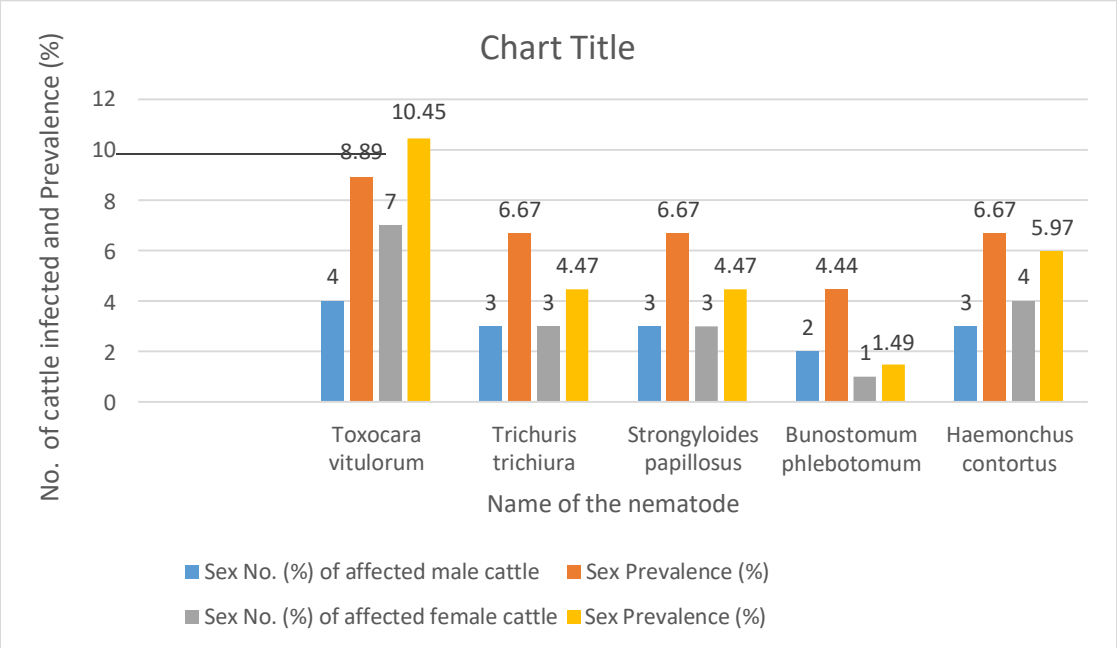

Figure 4.4 Prevalence of gastrointestinal nematode infestations according to sex

Table 4.5 Prevalence of gastrointestinal nematode infestations according to season

Name of the nematode	Season		
	No. (%) of affected cattle in winter season (n=39)	No. (%) of affected cattle insummer season (n=42)	No. (%) of affected cattle in rainy season (n=31)
Toxocara vitulorum	4 (10.26)*	4 (9.52)	3 (9.67)**
Trichuris trichiura	1 (2.56)	3 (7.14)	2 (6.45)
Strongyloides papillosus	2 (5.13)	3 (7.14)	1 (3.23)
Bunostomum phlebotomum	1 (2.56)	0 (0)	2 (6.45)
Haemonchus contortus	0 (0)	5 (11.90)*	2 (6.45)
Total	8 (20.51)	15 (35.71)	10 (32.26)

*Significant at p<0.05, **Significant at p<0.01,

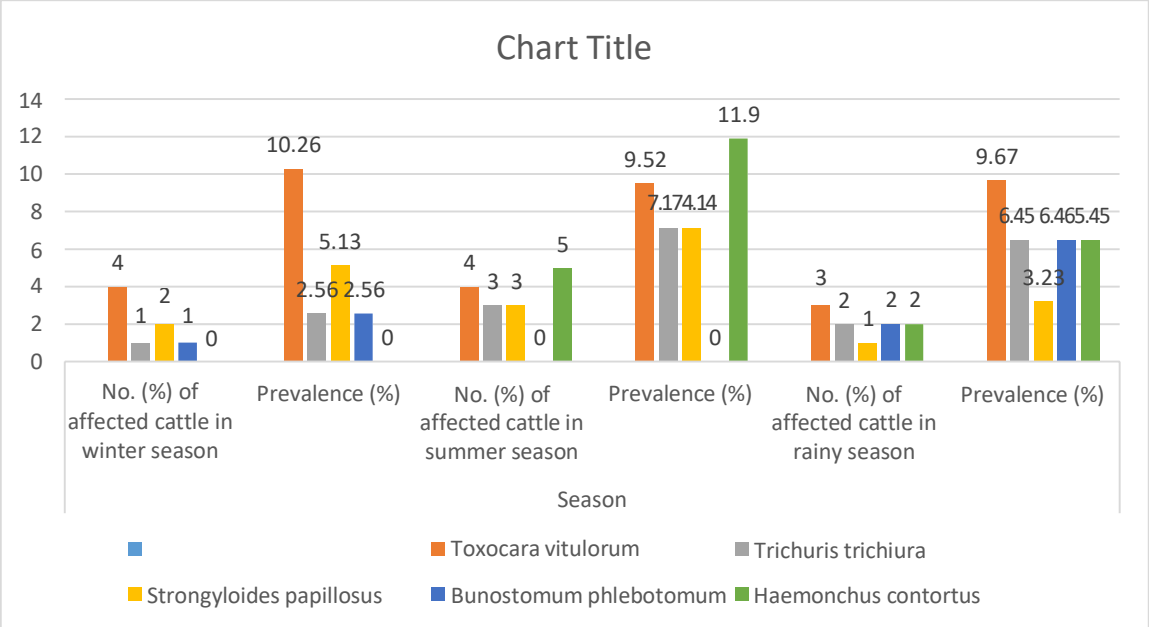

Figure 4.5 Prevalence of gastrointestinal nematode infestations according to season

Table 4.6 Prevalence of gastrointestinal nematode infestations according to management system

Management system	No. (%) of cattle infected	Prevalence (%)
Intensive (n=28)	7	25
Semi-intensive (n=38)	10	26.31
Extensive (n=46)	16	34.78

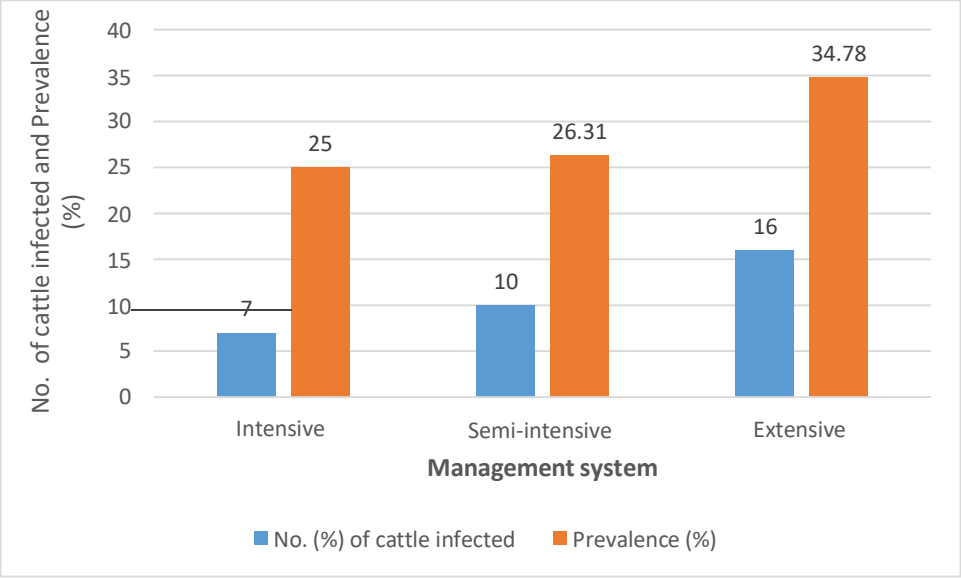

Figure 4.6 Prevalence of gastrointestinal nematode infestations according tomanagement system

Table 4.7 Prevalence of gastrointestinal nematode infestations according to Body Condition Score

BCS	(%) of cattleinfected	Prevalence (%)
3 (n=31)	8	25.80
2 (n=43)	12	27.91
1 (n=39)	13	33.33

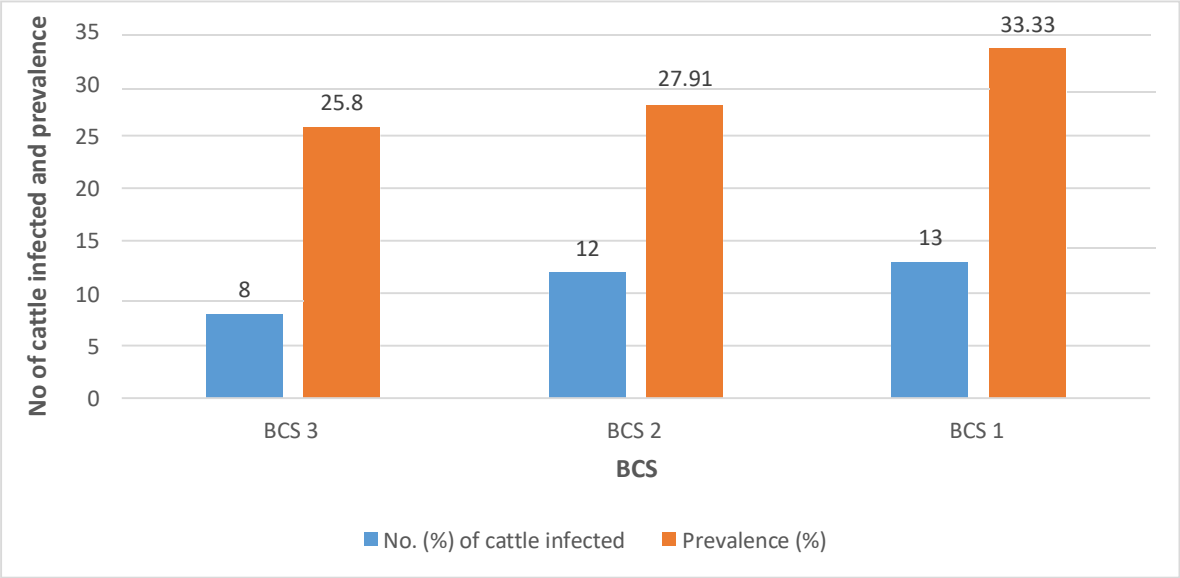

Fig. 4.7 Prevalence of gastrointestinal nematode infestations according to BCS

Table 4.8 Efficacy of anthelmintics against gastrointestinal nematode infestationin cattle

Type of infection	anti helmintics used	Name of parasite	No. of cattle treated	No. of cattle recovered (%)	No. of cattle unrecovered(%)	EPG before treatment (mean)	EPG two weeks after treatment(mean)
Single infection	Pow. Pipervet®	a	6	6	0	616.67	0
	Bol. Almex®	a	5	4 (80%)	1 (20%)	560	40
	Bol. LT vet®	b+c+d+e	11	10 (90.91%)	1 (9.09%)	600	33.33
	Bol. Levavet®	b+c+d+e	11	11 (100%)	0 (0%)	700	0
Mixed infection	Bol. Levavet®	a+b+c	1	1 (100%)	0 (0%)	600	0
	Bol. LT vet®	a+b+c	2	1 (50%)	1 (50%)	700	33.33
	Bol. Levavet®	b+c	1	1 (100%)	0 (0%)	800	0
	Bol. LT vet®	b+c	1	1 (100%)	0 (0%)	400	0
	Bol. Levavet®	b+c+e	2	2 (100%)	0 (0%)	400	0
	Bol. LT vet®	b+c+e	2	2 (100%)	0 (0%)	650	0

a= *Toxocara vitulorum,* b= *Trichuris trichiura,* c= *Strongyloides papillosus,* d= *Bunostomum phlebotomum* e= *Haemonchus contortus*

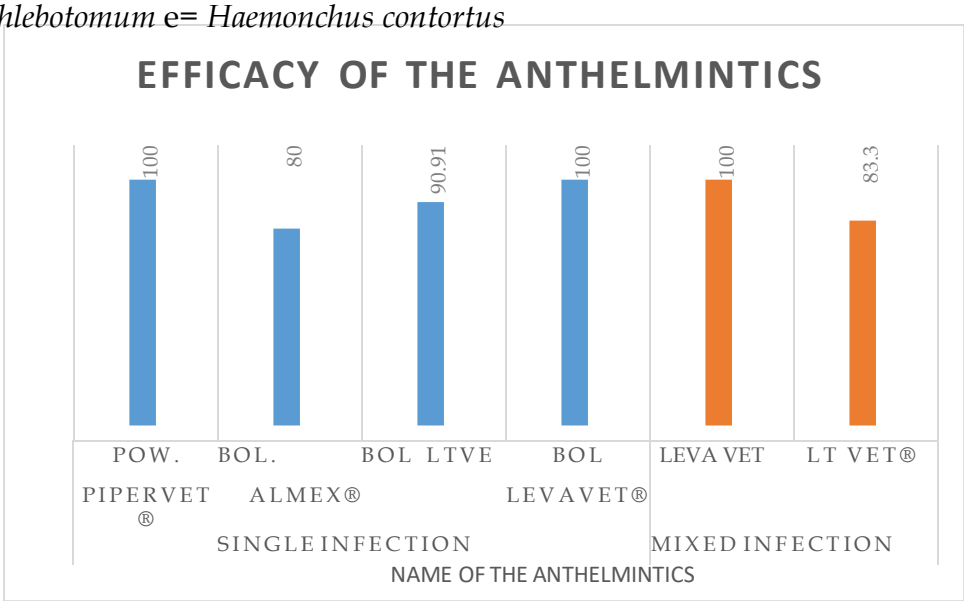

Fig. 4.8 Efficacy of anthelmintics against gastrointestinal nematode infestation in cattle

Table 4.9 Effect of anthelmintics on body weight of cattle

Name of Anthelmintics	Previous Body Weight (Mean)	Body Weight after 1 month (mean)	% Gained / % Decreased (Mean)
Pow. Pipervet®	45	49	8.88
Bol. Almex®	48	53	10.41
Bol. LT vet®	76	81	6.57
Bol. Levavet®	81	86	6.17

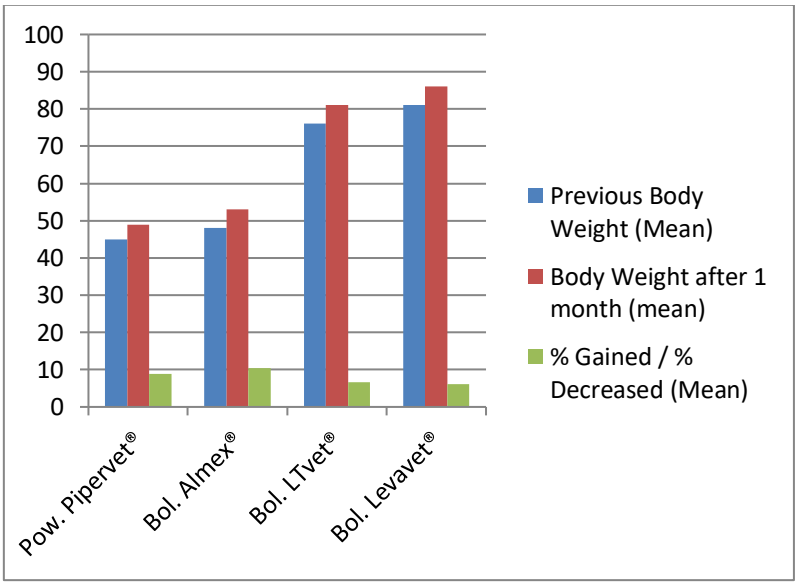

Fig. 4.9 Effect of anthelmintics on body weight of cattle

Figure 4.10: Egg of *Toxocara vitulorum in calf*

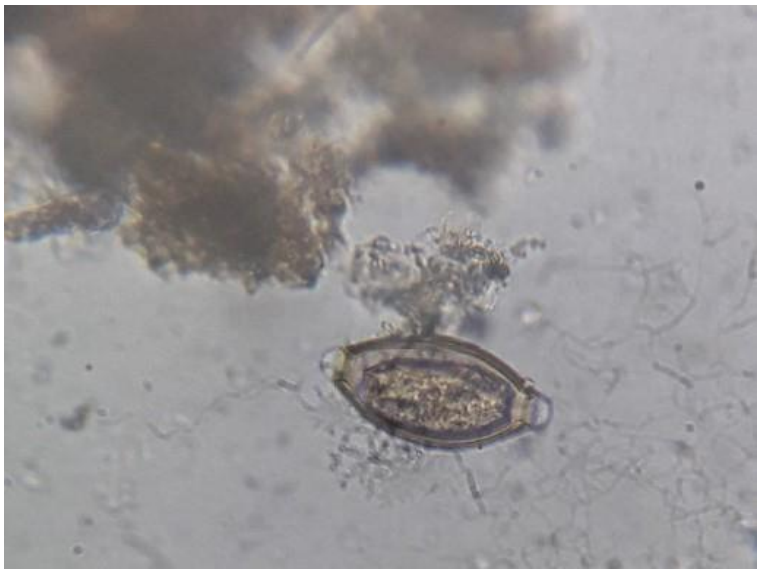

Figure 4.11: Egg of *Trichuris trichiura* in cattle

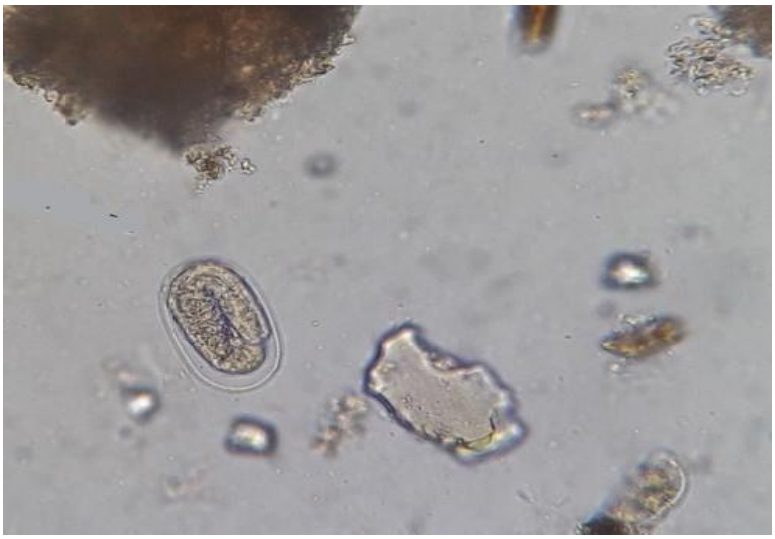

Figure 4.12: Egg of *Strongyloides papillosus* in cattle

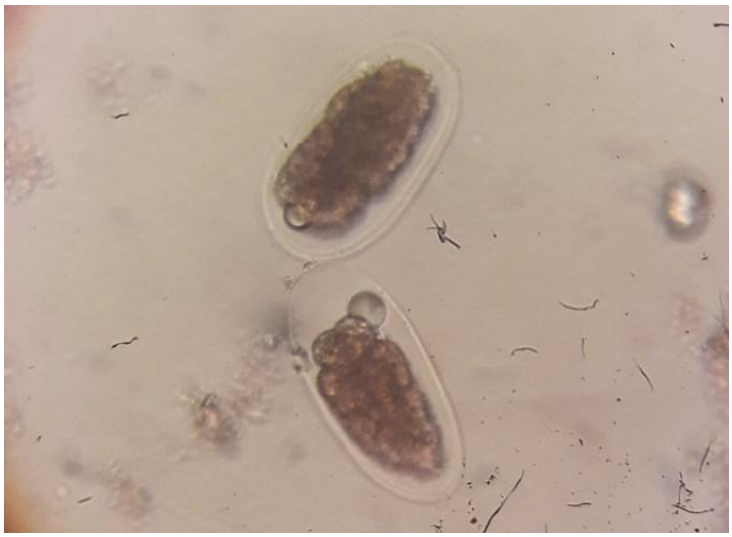

Figure 4.13: Egg of *stomach worm* in cattle

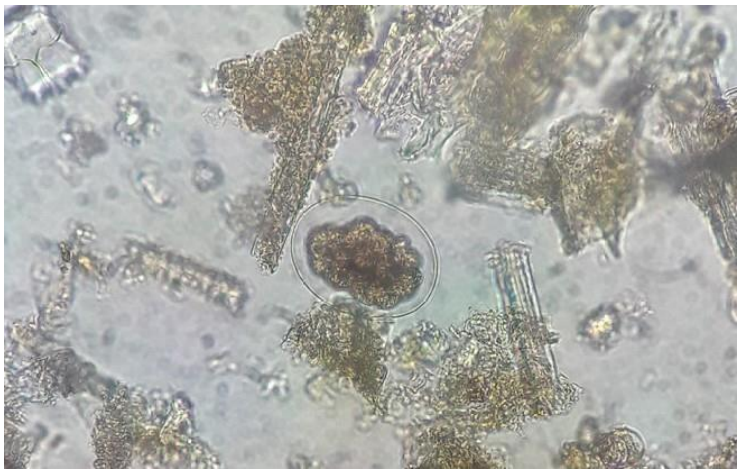

Figure 4.14: Egg of *hook worm* in cattle

DISCUSSION

The research was conducted to determine the prevalence of gastro-intestinal nematode infestation in indigenous cattle of Jhikargacha Upazilla of Jashore district and efficacy of some commonly used anthelmintics in Bangladesh. About 29.44% cattle were found to be infected with at least one type of helminth. This finding is very close to previous reports of other authors (Qadir et al. 1974) (Kabir MH et al. 2018). This study recorded prevalence of 9.82% for Ascariasis, 5.35% for Trichuriasis, 5.35% for Strongyloidosis, 2.67% for hook worm and 6.25% for stomach worm infection which also supports the findings of other authors (Md. Monirul Islam et al. 2015) (Ilyas N et al. 2016). Significantly higher prevalence of *Toxocara vitolurum* (36.67%) and *Trichuris trichiura* (6.67%) were observed in calves <1 year. Similar findings were also reported by some authors (Samaddar K et al. 2015) (Aktaruzzaman M et al. 2013). The higher prevalence of *Haemonchus contortus* 7.31% was found in adult cattle which were also reported by others (Samaddar K et al. 2015). Infestation rate is higher in calves than adult cattle. The prevalence of helminth parasitic infections was significantly higher in male (33.33%) than in female (26.86%) which is also contradictory with the findings of other authors (Kabir MHB et al. 2019) (Rashid MM et al. 2015). This contradiction is might be due to sample size of adult cattle and calves. In this study, during rainy season, 2nd highest prevalence was found in nematode infestation (32.26%) whereas some authors reported this season as highest prevalence (Gadre AS et al. 2007, Rashid MM et al. 2015). Cattle that are reared in extensive management system (34.78%) are more prevalent to nematode infection than intensive (25%) and semi-intensive (26.31%) rearing system (Kabir MHB et al. 2019). In this study, a significant difference was observed in prevalence of nematode infection in relation to body condition score where a higher prevalence of gastrointestinal nematodes parasites was recorded in poor (59%) and moderate (27.1%) body conditioned animals as compared to animals having good (21.7%) body condition. In addition, indicated that animals with poor condition are highly susceptible to

infection and may be clinically affected by worm burdens as compared to well-fed healthy animal. Moreover, Knox et al. observed that a well-fed animal was not in trouble with worms, and usually a poor diet resulted in more helminth infections. The study further revealed that cattle with medium and poor body condition score have higher prevalence rate of nematodiasis infection which is consistent with previous reports. This might be due to either well-fed animals have good immunity or parasitic infection leads to poor immunological response to the fecundity of the parasites. These Mixed infections have been suggested to be an important cause of morbidity and loss of production in cattle. Moreover, the presence of interaction and compromization of the immune system of the host by mixed infections described increase in their susceptibility to other diseases or parasites .The efficacy of Almex® and Pipervet® were found 80% and 100% respectively against infection of Ascariasis, also reported by some authors (Bhattacharyya et al. 2009) (Demeler J et al. 2009) (Islam MM et al. 2015). Levavet® was found 100% effective against single infection of hook worm, stomach worm, Strongyloidosis and *Trichuris* infection whereas LT vet® was found 90.91% effective against those infections. But an author reported higher prevalence in levamisole and other combination drug (Velarde FI et al. 2001). These differences may be due to some factors. For example, the efficacy trial was conducted in field conditions where fecal samples were tested and the owners were requested to treat their animals with prescribed anthelmintics. During post-treatment fecal sample collection it was also tried to know whether as such the treatment was given or not. But, if there are some gap in choice of drugs, dose and timings of the treatment, the efficacy will not reveal the true status of the drugs. The body weight of gastrointestinal nematodes infested cattle were increased ($p<0.01$) after treatment with different anthelmintics on 30th days. It might be due to proper digestion, absorption and metabolism of feed nutrient because of absence of gastrointestinal nematodes infection. Some workers found earlier improvement in body weight after treatment with anthelmintics (Hayet et al. 1985). Rajangam and Balachandran et al. 1989; Taylor et al. 1995; Ryan et al. 1997; Fornieles et al. 2000; Kaminsky et

al. 2008; Kuzmina and Kharchenko et al. 2008). Moreover, most farmers in the study area allowed partial grazing on pastures around the edges of forests due to pasture contamination. Furthermore, most of the farms under investigation did not practice routine deworming which are known to increase the risk of infection with gastrointestinal parasites in cattle due to immunosuppressive effects of concurrent infections. These results, in retarded growth, reduced productivity and increased susceptibility to other infections without been noticed, and this was very important from an economic point of view. Managements, especially feeding system and age were found to be important risk factors in the incidence of nematode in cattle. Thus, alternatively uses of different antihelminthes for strategic deworming to treat clinical and subclinical cases, indoor feeding, rotational grazing with further study on the impact of nematodes on growth rate and production performance of dairy animal were recommended (Adem et al. 2011). Therefore during the control and treatment of cattle nematodiasis; age, BCS and Species should be considered as risk factors for the occurrence of the disease. Further studies on the economic importance of helminthiasis and drug resistance patterns of anthelmintics should be conducted for the holistic implementation of nematodes control in addition to effective strategic treatment and public awareness creation.

CHAPTER V

SUMMARY AND CONCLUSIONS

The study was to determine the prevalence of gastrointestinal nematodiasis and effects of the anthelmintics on body weight of cattle. The fecal samples were collected from 112 indigenous cattle from Jhikargacha Upazilla of Jashore district with a random sampling. Fecal sample examination of all the selected cattle were affected single type of GI nematode showed that 29.44% (33) animals. Mixed infections were observed in 8.03% cattle where two or more species of nematodes are noticed. Although a modern anthelmintics are being used worldwide to treat and control parasitism in cattle. But their information on their uses and effectiveness at the farmers are scanty. Most of the farmers are unaware of the extent of the loss caused by parasites in their cattle. As a result cattle are frequently suffered from malnutrition. Parasitic infestation is a major constraint of cattle production and causes great economic loss to dairy industry by way of retarded growth, low productivity and increased susceptibility of animals to other infections.The overall prevalence of gastrointestinal nematode infestation is significantly higher in male cattle in the study area. Among gastro-intestinal nematodes, Ascariasis (9.82%) is the most prevalentfollowed by stomach worm (25.6%) infestation in the study area. Piperazine Citrate is the preferable drug for treatment of Ascariasis. Levamisole is the best choice of drug for nematode infestation but combination of levamisole drug may be good choice for other infestation. Further study is recommended to identify the risk factors of nematode diseases in the study area. After using anthelmintics on 30th day's body weight of gastrointestinal nematodes infested cattle were increased. It occurs due to proper digestion, absorption and metabolism of feed nutrient because of absence of gastrointestinal nematodes infection. Body weight was gained after 1 month Using Pipervet®, Almex®, LT vet® and Levavet® 8.88%, 10.41%, 6.57%, 6.17% respectively. Body weight gain high in using of Almex® anthelmintics against gastrointestinal nematodes infestation.

CHAPTER VI

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