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EFFECTS OF FENBENDAZOLE AND PIPERAZINE CITRATE ON EPG, HEMATOLOGICAL PARAMETERS AND BODY WEIGHT IN ASCARIASIS IN CALVES AT SYLHET GOVERNMENT DAIRY FARM IN BANGLADESH

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Abstract

The study aimed to evaluate the efficacy of fenbendazole and piperazine citrate against ascariasis in naturally infected calves of Sylhet government dairy farm, Sylhet, Bangladesh. The study included 84 calves of which 40 were naturally infected. Twenty calves of 1-8 month old were selected on the basis of body weight and faecal egg counts irrespective of sex infested with ascariasis for this experiment and were randomly divided into four equal groups (group A, B, C and D) where each group consisted of 5 calves and calves of group D were kept as control. Two fenbendazole (7.5 mg kg^{-1} body weight, orally) and piperazine citrate (220 mg kg^{-1} body weight, orally) preparations were used for treatment of ascariasis in group A, B and C, respectively. Before trials (day 0), total egg count, blood samples and initial body weight were recorded. During the study the fecal and blood samples were collected directly from the rectum and jugular vein, respectively on 7^{th}, 14^{th}, 21^{st} and 28^{th} day. Fecal samples were examined using McMaster fecal egg counting method. Body weights were recorded on day 0 and day 28 following the treatments. The comparative efficacies of different anthelmintic of two fenbendazole were 95.50% and 95.58%, followed by piperazine citrate 97.27%, respectively. McMaster fecal egg counting method discloses the percentage of prevalence of ascariasis 35.71% (1-2 months), 24.00% (3-4 months), 21.74% (5-6 months) and 18.18% (7-8 months), respectively. After treatment with two fenbendazole and piperazine citrate, total erythrocyte count (TEC), hemoglobin (Hb) content and packed cell volume (PCV) increased significantly ($p<0.01$) in calves but erythrocyte sedimentation rate (ESR) and total leukocyte count (TLC) decreased significantly ($p<0.05$) in all treated calves. Body weight increased significantly ($p<0.01$) on day 28. Results of the present study revealed the efficacy of multiple anthelmintic against gastrointestinal nematodes in calves. Further studies are required to understand the efficacy of the anthelmintics widely used in different agro-ecologies and livestock industry in Bangladesh.

Keywords: Comparative efficacy, anthelmintic, EPG, hematology, body weight, ascariasis

Introduction

Bangladesh is an agro-economy based developing country of the world, where more than 80% rural people rear indigenous cattle. The livestock is an important sub-sector which is considered as the backbone of agriculture in Bangladesh (BBS, 1998) and approximately 80% people depend on it directly or indirectly for their subsistence. Cattle farming play a vital role in the national economy. The total contribution of animal farming sector in Bangladesh to gross domestic products (GDP) is approximately 3.02% (Anon, 2000) and livestock sector contributing about 2.67% GDP (Economic index, 2010). The livestock population in Bangladesh is currently estimated to comprise 26.828 million cattle, 0.544 million buffaloes, 16.242 million goats and 1.221 million sheep (BBS, 2010) which plays an important role in the rural economy (Kamaruddin, 2003). Ruminants constitute the major portion of livestock, which are used for draft purpose, meat, and milk and also important for good quality leather and a source of income for farmers. The agro-ecological and geo-climatic condition of Bangladesh is favorable for parasites of which the helminth parasite predominates. It depends directly or indirectly on several interacting factors, which include climate, weathers, management, age, hereditary and physiological state of the health of the host. Parasitism has been considered as one of the major constraints of livestock production (Jabbar and

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Green, 1983). Despite the special emphasis on the rearing ruminants, the development of this industry in Bangladesh is seriously threatened. It is thought to be one of the major constraints that hinder the development of livestock population (Kakar and Kakarsulemankhel, 2008). The infection causes productivity losses through reduced feed intake and decreased efficiency in feed utilization due to subclinical or chronic infections that are responsible for economic losses (Rinaldi *et al.* 2011). The cattle kept with high level of nutrition and in better management yet declined in their health and productivity, due to their regular infestation with gastrointestinal parasites. Asian development Bank (ADB, 1984) estimated that the loss of animal production due to parasitic diseases was 50% in Bangladesh. However, 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). Among the parasitic diseases ascariasis is a serious problem in the new born calves. The calves get infection directly from the mother by both prenatal and transmammary infection and causes serious health hazards that lead to high percentage of calf mortality (Soulsby, 1982). It is assumed that ascariasis is the major impediment for growth and development of cattle in Bangladesh. Using a routine prophylactic anthelmintics treatment could ensure control of the disease. Sylhet dairy farm was choosen because it is the demonstration farm of the DLS and no such type of experiment was performed over there in the earlier. The present study is aimed to evaluate the effects of three modern anthelmintics two fenbendazole and piperazine citrate against ascariasis in calves their effects on the basis of EPG (eggs gram^{-1}) count, body weight and hematological parameters.

Materials and Methods

The experiment was conducted in the Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University (SAU) and government dairy farm, Sylhet was selected for this study. The research was carried out during the period of September to December, 2010. The study included 84 calves, of which 40 were infected and randomly selected on the basis of their weight and egg count. Twenty calves of 1-8 months old were selected within the randomly sampling calves which were severely infected with ascariasis irrespective of the species of parasites involved. These twenty calves were randomly divided into four groups each comprising of five calves and marked as A, B, C and D.

Blood and fecal samples were collected from each calf and a proper identification tag was allocated and was immediately brought to the Physiology and Pharmacology Laboratory of SAU, Sylhet, Bangladesh for fecal examination. Weekly EPG (eggs gram^{-1}) count was done on day 7th, 14th, 21st, 28th post treatment by McMaster egg counting technique. McMaster fecal egg count method described by (Gordon and Whitlock, 1939) was used. For the hematological examination, blood was collected with sterile syringe and needle maintaining aseptic condition, 5 ml of blood sample was collected from jugular vein of each calf and kept in vials containing anticoagulant (sodium-EDTA) and this was done on day of 0, 7th, 14th, 21st and 28th during experimental period. The hematological parameters were examined in the laboratory of the department of Physiology and Pharmacology, Sylhet, Bangladesh. The body weights of all experimental calves were measured on day "0" and 28th day of experiment as per method cited by (Samad, 1996). Body weight = Length × (Girth)^2/300 × 2.2 kg Here; Length = Length from the point of shoulder to the buttock in inches. Girth was also measured in inches at the point of xyphoid cartilage.

Calves of group A were treated with (Fenbendazole 250 mg) orally at the dose rate of 7.5 mg kg^{-1} body weight, group B were treated with (Fenbendazole 250mg) orally at the dose rate of 7.5 mg kg^{-1} body weight, group C were treated with (Piperazine citrate 100gm) orally at the dose rate of 220 mg kg^{-1} body weight and calves of group D served as untreated control.

All the calves of treated and control groups were closely observed for 28 days after treatment. The fecal samples were collected from the treated and control groups of calves on 7th, 14th, 21st and 28th day of treatment to investigate the fecal egg count. The blood samples were collected from the treated and untreated control groups on day '28' of treatment and hematological parameters TEC, Hb, PCV, ESR and TLC were determined as per method used by Coffin, 1995. All the data were statistically analyzed using statistical package programmed MSTAT-C developed by Russel (1996) and following the standard methods by Snedecor and Cochran, 1967 and student "T" test (Gupta, 1978). The eggs of parasites were identified on the basis of morphological characteristics as described by Soulsby, 1986 and then counted. The percentage of reduction of EPG was calculated as N1-N2/N1×100; N1= Number at day "0"; N2 = Number on next counting day. The body weight, hematological parameters and total egg count of ascariasis were recorded prior to administration of drugs.

Results and Discussion

Effects of fenbendazole and piperazine citrate on egg count EPG in calves

The results of the effects of fenbendazole and piperazine citrate based on fecal egg counts reduction on naturally infested calves are presented in Table 1. In the treatment group A mean EPG count before treatment 800.00±70.71 and after treatment mean EPG (eggs gram^{-1}) on 7th, 14th, 21st and 28th day were 384.00±33.25, 190.00±16.04, 116.00±8.86 and 36.00±44.30, respectively. The rates of reduction of mean EPG (eggs gram^{-1}) on day 0 and 28th day after treatment were 95.50%. The similar results were also reported by the following authors; Gautum *et al.* (1976) found that fenbendazole at the dose rate of 7.5 mg kg^{-1} body weight and 10 mg kg^{-1} body weight orally on calves found 100% effective at both doses levels against nematodiasis in buffalo calves of 1 to 8 months. Prasad (1985) stated that fenbendazole at the dose rate of 10 mg kg^{-1} body weight orally on calves were found 96%, 98% and 100% effective against nematodiasis in buffalo calves of 1 to 8 months, respectively. Haque *et al.* (1987) showed that fenbendazole at the dose rate of 7.5 mg kg^{-1} body weight orally was 100% effective against gastrointestinal nematodes in naturally parasitized calves of 1 to 4 months in Bangladesh. Miller *et al.* (1992) showed that fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally has reduction of 100% egg count and body weight gain in parasitized buffalo calves of 1 to 8 months. Thejomoorthy *et al.* (1995) recorded that fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally was 100% effective as tablet and 97.9% as a drench against nematodes in calves of 2 to 5 months. Maqbool *et al.* (1996) reported that fenbendazole at the dose rate of 7.5 mg kg^{-1} body weight orally and the rate of reduction egg count was 92.4% against ascariasis in buffalo calves of 3 to 9 months. Similar results have also been stated by some researchers; Stevenson *et al.* (2002) stated the efficacy of triclabendazole and ivermectin in combination against liver fluke and gastrointestinal nematodes in cattle and sheep. Islam *et al.* (2003) stated the efficacy of ivermectin against gastrointestinal nematodes and ectoparasites in calves. A few works was carried out to determine the efficacy of these types of anthelmintics in different areas of Bangladesh not in Sylhet.

Table 1. Effects of fenbendazole and piperazine citrate on egg count EPG in calves

Groups	Treatment	Pre-treatment	Post-treatment				
		Day 0	Day 7	Day 14	Day 21	Day 28	% Reduction at day "28"
G_A	Fenbendazole	800.00 ± 70.71	384.00 ± 33.25**	190.00 ± 16.04**	116.00 ± 8.86**	36.00 ± 44.30**	95.50
G_B	Fenbendazole	770.00 ± 51.47	367.00 ± 23.85**	185.00 ± 6.52**	121.00 ± 6.78**	34.00 ± 2.21**	95.58
G_C	Piperazine Citrate	824.00 ± 2.21	418.00 ± 25.38**	224.00 ± 12.08**	117.00 ± 3.743**	39.00 ± 0.24**	97.27
G_D	Control group	746.00 ± 20.39	772.00 ± 20.83**	800.00 ± 18.17**	812.00 ± 18.28**	826.00 ± 18.60**	10.72

*** = Significant at 1 percent level (p<0.01)*

In treatment group B, the pre-treatment mean EPG count was 770.00±51.47 and the post-treatment (eggs gram^{-1}) mean EPG count values at 7th, 14th, 21st and 28th day were 367.00±23.85, 185.00±6.52, 121.00±6.78 and 34.00±2.21, respectively. The rates of reductions were significantly increased to the extent of mean EPG on day 0 and 28th day after treatments were 95.58%. The findings of the present study are more or less similar to the following researchers; Sinha *et al.* (1987) studied that fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally 99.68% efficacies against ascariasis in calves of 3 to 10 months. Bagherwal (1992) examined fenbendazole at the dose rate of 7.5 mg kg^{-1} body weight and 10 mg kg^{-1} body weight orally 100% efficacies against *Toxocara vitulorum* in dairy buffaloes

and calves of 1 to 8 months. Williams and Broussared (1995) reported that fenbendazole at the dose rate of 7.5 mg kg^{-1} body weight and 10 mg kg^{-1} body weight orally 100% effective against gastrointestinal nematodes in calves of 1 to 8 months. Thejomoorthy *et al.* (1995) reported that fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally 100% effective as tablet and 97.9% efficacy as a drench against gastrointestinal nematodes infection in calves of 2 to 5 months. Maqbool *et al.* (1996) reported that fenbendazole at the dose rate of 7.5 mg kg^{-1} body weight orally and the rate of reduction egg count was 72-92.4% against ascariasis in buffalo calves of 3 to 9 months. Quioroz-Romero and Manga-Gonzalez (1996) studied fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally 82%, 98%, 96% and 93% fecal egg counts reduction against gastrointestinal and pulmonary nematodes in cattle of 2 to 4 years.

In treatment group C, the pre-treatment mean EPG (eggs $gram^{-1}$) count was 824.00±2.21 and the post-treatment mean EPG (eggs $gram^{-1}$) count values at 7^{th}, 14^{th}, 21^{st} and 28^{th} day were 418.00±25.38, 224.00±12.08, 117.00±3.74 and 39.00±0.24, respectively. The rates of reductions were significantly increased to the extent of mean EPG (eggs $gram^{-1}$) on day 0 and 28^{th} day after treatments were 97.27%. These results are more or less similar to the several researchers; Sinha *et al.* (1987) studied fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally 99.9% efficacy against ascariasis in calves of 3 to 10 months. Steffan *et al.* (1988) showed topical application of fenbendazole at the dose rate of 5 mg kg^{-1} body weight orally 99-100% efficacies against gastrointestinal and pulmonary nematodes in cattle of 3 to 6 years. Roberts (1989) studied 42% and 57% efficacy against immature and mature parasites in calves at the dose rate of fenbendazole 5 mg kg^{-1} body weight orally of buffalo calves of 1 to 2 months. Danek *et al.* (1983) recorded that piperazine citrate at the dose rate of 220 mg kg^{-1} body weight orally was 100% effective against ascarid worms in buffalo calves of 3 to 5 months.

Mean body weight of untreated control group D (day 0) EPG (eggs $gram^{-1}$) count was 746.00±2.39 and on the EPG count values at 7^{th}, 14^{th}, 21^{st} and 28^{th} day were 772.00±20.83, 800.00±18.17, 812.00±18.28 and 826.00±18.60, respectively and the rate of EPG count was increased. The efficacies of the products were evaluated on the basis of the percentage of reduction in mean egg count compared to the mean egg count $gram^{-1}$ of feces. A significant ($p<0.01$) reduction of EPG count was found on 7^{th}, 14^{th}, 21^{st} and 28^{th} day of treated goat of group A, B and C, respectively.

Effects of fenbendazole and piperazine citrate on hematological parameters

Total Erythrocyte Count (TEC): The effects of anthelmintics fenbendazole and piperazine citrate on TEC of calves for 28 days at 7 days interval was shown in Table 2. The pre-treatment values of TEC (million cu^{-1} mm of blood) were 5.94±0.07, 6.06±0.25 and 6.08±0.24 in the calves of group A, B and C, respectively. On 28^{th} day of the post-treatment, the mean values of TEC were increased up to 6.94±0.08, 6.84±0.04 and 6.99±0.18 in the calves of group A, B and C, respectively. The mean value of TEC in control group (group D) was 5.96±0.05 but the mean values of TEC started to decrease on 28^{th} day and recorded as 5.70±0.12. The mean value of TEC was significantly increased ($p<0.01$) on 28^{th} day of the treatment of three anthelmintics. These results are more or less similar with the earlier researchers of Nettleton and Beckett (1976), Anwar *et al.* (1996), Soutello *et al.* (2007), Demeler *et al.* (2009), Mukherjee (1992) and Sharma and Jagadish (1991) in calves.

Hemoglobin (Hb) concentration: The pre-treatment values of Hb (g %) were 6.58±0.17, 7.98±0.42 and 8.30±0.46 in the calves of group A, B and C, respectively. On 28^{th} day of the post-treatment, the mean values of Hb (g %) were increased up to 9.70±0.04, 9.56±0.29 and 9.98±0.52 n the calves of group A, B and C, respectively. The mean value of Hb (g %) in control group (group D) was 7.90±0.48 but the mean values of Hb (g %) started to increase on 28^{th} day and recorded as 7.00±0.47. The mean value of Hb (g %) was significantly increased ($p<0.01$) on 28^{th} day of three anthelmintics treatment. Similar results have also been stated with the earlier researchers of Mukherjee (1992), Nettleton and Beckett (1976), Anwar *et al.* (1996), Soutello *et al.* (2007), Amin *et al.* (2005) and Nwosu *et al.* (2007) in calves.

Packed Cell Volume (PCV): The pre-treatment values of PCV were 32.00±0.70, 32.40±0.58 and 32.80±0.40 in the calves of group A, B and C, respectively. On 28^{th} day of the post-treatment, the mean values of PCV were increased up to 33.90±0.43, 33.90±0.43 and 34.70±0.37 in the calves of group A, B and C, respectively. The mean value of PCV in control group (group D) was 34.20±0.37 but the mean values of PCV started to increase on 28^{th} day and recorded as 33.90±0.43. The mean value of PCV was significantly increased ($p<0.01$) on 28^{th} day of three anthelmintics treatment. These results have are more or less similar with the report of Nettleton and Beckett (1976) declined PCV value was observed in control group. Similar results have also been stated by the earlier workers of

Nettleton and Beckett (1976), Prodhan *et al.* (1991), Anwar *et al.* (1996), Amin *et al.* (2005) and Soutello *et al.* (2007) in calves.

Table 2. Effects of fenbendazole and piperazine citrate on hematological parameters in control and study groups of calves at day 28 post-treatment

Groups	Treatment	Pre-treatment					Post-treatment				
		Day 0					Day 28				
		TEC	Hb	PCV	ESR	TLC	TEC	Hb	PCV	ESR	TLC
G_A	Fenbendazole	5.94 ± 0.07	6.58 ± 0.17	32.00 ± 0.70	0.08 ± 0.02	7.86 ± 0.11	6.94 ± 0.08**	9.70 ± 0.04**	33.90 ± 0.43**	0.01 ± 0.01*	7.57 ± 0.21*
G_B	Fenbendazole	6.06 ± 0.25	7.98 ± 0.42	32.40 ± 0.58	0.12 ± 0.04	7.86 ± 0.07	6.84 ± 0.04**	9.56 ± 0.29**	33.90 ± 0.43**	0.02 ± 0.02*	7.56 ± 0.20*
G_C	Piperazine Citrate	6.08 ± 0.24	8.30 ± 0.46	32.80 ± 0.40	0.06 ± 0.024	7.98 ± 0.07	6.99 ± 0.18**	9.98 ± 0.52**	34.70 ± 0.37**	0.01 ± 0.010*	7.55 ± 0.15*
G_D	Control group	5.96 ± 0.05	7.90 ± 0.48	34.20 ± 0.37	0.06 ± 0.02	7.80 ± 0.10	5.70 ± 0.12*	7.00 ± 0.47*	33.90 ± 0.43*	0.18 ± 0.02**	8.08 ± 0.86**

TEC = Total erythrocytes count; Hb = Hemoglobin; PCV = Packed cell volume;
ESR = Erythrocyte Sedimentation Rate; TLC = Total leukocyte count; SE = Standard Error
*** = Significant at 1 percent level (p<0.01); * = Significant at 5 percent level (p<0.05)*

Table 3. Effects of fenbendazole and piperazine citrate on body weight (kg) gain/loss of calves in various treatment days

Groups	Treatment	Pretreatment	Post-treatment		Live weight gain/loss (kg)	Improvement (%)
		Day 0	Day 28			
		Body weight (kg)	Body weight (kg)	% change		
G_A	Fenbendazole	42.20±2.46	43.30±1.79**	3.02	+1.1	+2.5
G_B	Fenbendazole	42.60±3.50	43.60±1.03**	2.93	+1	+2.3
G_C	Piperazine Citrate	41.80±3.26	44.80±3.26**	1.44	+1	+2.3
G_D	Control group	39.60±2.06	38.60±1.50**	-0.90	-1	-2.5

*** = Significant at 1 percent level (p<0.01)*

Erythrocyte Sedimentation Rate (ESR): The initial control values of ESR (mm h^{-1}) were 0.08±0.02, 0.12±0.04 and 0.06±0.024 in the calves of group A, B and C, respectively. On 28th day of the post-treatment, the mean values of ESR (mm h^{-1}) were increased up to 0.01±0.01, 0.02±0.02 and 0.01±0.010 in the calves of group A, B and C, respectively. The mean value of ESR (mm h^{-1}) in control group (group D) was 0.06±0.02 but the mean values of ESR (mm h^{-1}) started to increase on 28th day and recorded as 0.18±0.02. The mean value of ESR (mm h^{-1}) was significantly decreased ($p<0.05$) on 28th days of treatment. This result is similar to the reports of Nettleton and Beckett (1976) and Prodhan *et al.* (1991), Mortensen *et al.* (2003), Demeler *et al.* (2009) in calves.

Total Leukocyte Count (TLC): The pre-treatment values of TLC were 7.86±0.11, 7.86±0.07 and 7.98±0.07 in the calves of group A, B and C, respectively. On 28th day of the post-treatment, the mean values of TLC were increased up to 7.57±0.21, 7.56±0.20 and 7.55±0.15 in the calves of group A, B and C, respectively. The mean value of TLC in control group (group D) was 7.80±0.10 but the mean values of TLC started to increase on 28th day and recorded as 8.08±0.86. The mean value of TLC was significantly decreased ($p<0.05$) on 28th days of treatment. These present findings in agreement of the works with Ogunsusi (1978), Akbaev (1986), Ahmed and Ansari (1989), Anwar *et al.* (1996), Amin *et al.* (2005), Soutello *et al.* (2007) in calves.

Effects of fenbendazole and piperazine citrate on body weight: The mean initial body weight on day '0' of calves in group A, B and C were 42.20±2.46, 42.60±3.50 and 41.80±3.26 kg, respectively. On the 28th day of the post-treatment, the mean values of body weight were increased up to 43.30±1.79, 43.60±1.03 and 44.80±3.26 in the calves of group A, B and C, respectively. The body weight increased significantly ($P<0.01$) after treatments in group

A, B and C. The body weight was increased and this may be due to removal of parasitic load, proper absorption and metabolism of nutrient in the parasite free gastrointestinal tract. The body weight gains in the ivermectin, levamisole and albendazole treated goats are supported by Isles *et al.* (1985) in heifers. On the other hand, the body weight significantly decreased in untreated control group due to overload of parasites within the body of calves. The improvement percentage in calves of group A, B and C after 28^{th} day was 2.5%, 2.3% and 2.3%, respectively. It may be concluded that the post-treatment improvement of body weight in calves due to better utilization of food. The main initial body weight on day '0' of calves in group A, B and C was nearly similar and was 42.20±2.46, 42.60±3.50 and 41.80±3.26 kg, respectively. In the control group (group D) body weight was reduced to the extent of 0.90% after 28^{th} day (Table 3). 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) and Kuzmina and Kharchenko (2008).

During the study of hematological parameters it was found that after treatment with two fenbendazole and piperazine citrate TEC, Hb and PCV were significantly ($p<0.01$ and $p>0.05$) increased and on the other hand, ESR and TLC was significantly ($p<0.05$ and $p>0.01$) decreased in treated groups (Table 2). The mean value of Hb, PCV and TEC were decreased and ESR, TLC values were increased in untreated naturally parasitized control group. This study indicated that piperazine citrate is a more effective drug against ascaeriasis in calves than that of fenbendazole.

The findings of the present study revealed that two fenbendazole and piperazine citrate were highly effective for the reduction of EPG of ascariasis in calves. This study indicated that piperazine citrate were highly effective EPG and hematological parameters (TEC, Hb, PCV, ESR and TLC) in ascariasis in calves than that of fenbendazole during the experiment. These three anthelmintics got wide therapeutic index and were capable of killing or inhibiting egg production of gastrointestinal nematodes. From this study, it is suggested that calves should be regularly monitored through faecal examination for the presence of gastrointestinal parasites in order to provide rational treatment and to make the cattle farming profitable. The findings of the present study may help the future researchers to explore the details pharmacokinetic and toxic effects, for wide therapeutic uses in Bangladesh for the treatment and control of parasitic infection in calves. Further studies are required to understand the efficacy of anthelmintics widely used in different agro ecologies, animal species and livestock management systems in Bangladesh. From these research findings the veterinarian may use the specific anthelmintics for ascariasis in calves. Further studies on anthelmintics pharmacokinetic and toxicity would be helpful. These findings will be milestone for further detailed study related to preventive and control measures against ascariasis.

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