

Evaluation of Anthelmintic Efficacy of Ivermectin, Levamisole HCl and Albendazole Administered through Different Routes against Naturally Occuring Gastrointestinal Nematodiasis in Black Bengal Goat Inducing Hematological Parameters and Live Weight Indices

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ABSTRACT

This study aimed to evaluate the efficacy of ivermectin, levamisole HCl and albendazole against gastrointestinal nematodes in naturally infected goats of government goat development farm, Sylhet, Bangladesh. The study included 52 black Bengal breed of which 30 were naturally infected and randomly selected 20 on the basis of their weight and egg count. Twenty black Bengal goats of 12-13 month old irrespective of sex infested with gastrointestinal nematodes were selected for this experiment and randomly divided into four equal groups (group A, B, C and D) where each group consisted of 5 goats and goats of group D were kept as control group. One injectable ivermectin (200µgkg⁻¹ body weight, S/C) preparations (Techno Drugs Ltd. Bangladesh) and two solid levamisole HCl, albendazole (7.5 mgkg⁻¹ body weight, orally) preparations (The ACME Laboratories Ltd. and Square Pharmaceuticals Ltd. Bangladesh) were used for positive control of gastrointestinal nematodes as group A, B and C. Goats of group D was kept as control without giving any treatment. Before trials (day 0), total egg count, blood samples and initial body weight were recorded. During the study period the fecal and blood samples were collected directly from rectum and examined on 7th, 14th, 21st and 28th day using McMaster fecal egg counting method. Body weight was recorded on day 28 following the treatments. The results of the comparative efficacies of different anthelmintic of ivermectin was 86.75%, followed by levamisole HCl 85.07% and albendazole 92.81%. McMaster fecal egg counting method discloses the percentage of *Haemonchus* spp. (15.38%), with *Trichostrongylus* spp, *Strongyloides* spp., and *Cooperia* spp. also present. After treatment with ivermectin, levamisole HCl and albendazole, Total Erythrocyte Count (TEC), Hemoglobin (Hb) content and Packed Cell Volume (PCV) were increased significantly (p<0.01 and p>0.05) in goats but Erythrocyte Sedimentation Rate (ESR) and Total Leukocyte Count (TLC) were decreased significantly (p<0.05 and p>0.01) in all treated goat and body weight was increased significantly (p<0.01) on day 28.

Key words: Efficacy, Anthelmintics, EPG (eggs per gram), hematology, body weight, gastrointestinal nematodes, goats and Sylhet.

INTRODUCTION

Bangladesh is an agro based country. The livestock is an important sub-sector which is considered to be the backbone of agriculture in Bangladesh [3] and approximately 80% people depend on it directly or indirectly for their subsistence. Among livestock, the population in Bangladesh is currently estimated to comprise 20.75 million goats [8]. Black Bengal Goat rearing is very popular in Bangladesh and treated locally as “cow of poor people”. Goats play a vital role in the subsistence economy of smallholders in Bangladesh. There are about 38.1 million small ruminants (goats and sheep) in Bangladesh [11] which play an important role in the rural economy and earn substantial amount of foreign currency by exporting skins and other by products [29]. Goat rearing contributes greatly to the poverty stricken rural people, especially to small and marginal farmers and landless laborers holding less than 2 acres of land [18,46]. The domestic goat is a sociable, inquisitive, and intelligent species, which has been used for its meat, milk, skin, and fur since it was first domesticated 10,000 years ago [12]. The climatic condition of Bangladesh is favorable to the

ecological conditions suitable for parasites of which the helminth parasite predominates. Parasitism has been considered as one of the major constraints of livestock production [28], helminthiasis especially gastrointestinal nematodiasis overwhelming a severe havoc on health and production [44, 39, 49] throughout the world due to impacts on economy also [47] and market value of the living animals [24] with a high rate of anthelmintic resistance prevalence [23, 30]. The main gastrointestinal nematodes playing lower productivity Black Bengal Goats typically take account of *Haemonchus*, *Oesophagostomum*, *Ostertagia*, *Cchabertia*, *Nematodirus*, *Trichuris*, *Moniezia* and *Fasciola* [19]. The incidence of gastrointestinal nematodes in goats and sheep in Mymensingh was reported by [20]. The use of sustainable, integrated parasite control systems, using scientifically proven non-chemical methods and limited use of drugs is being considered to ensure animal health and food safety [58]. We can prevent and control the parasitic diseases by using a routine prophylactic anthelmintic measurement. The anthelmintic activities and therapy of ivermectin, levamisole HCl and albendazole have been studied [9]. Ivermectin produces flacid paralysis of parasites

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by acting as an agonist of the neurotransmitter Gamma Amino Butyric Acid (GABA), thereby disrupting GABA-mediated Central Nervous System (CNS) neurosynaptic transmission [7]. albendazole act by inhibiting tubulin polymerization, whereas oxclozanide lowers the essential ATP through uncoupling oxidative phosphorylation [10]. Modern anthelmintic such as Benzimidazoles like albendazole and levamisole HCl are widely used in Bangladesh and very recently ivermectin is being used sporadically. The present investigation was aimed to evaluate the effect of modern anthelmintics Vermic® (Ivermectin), Levavet® (Levamisole HCl) and Almex-vet® (Albendazole) against gastrointestinal nematodiasis in goats irrespective to the species involved and their effects on the basis of EPG (eggs per gram) count, body weight of goats and hematological parameters like Total Erythrocyte Count (TEC), Hemoglobin % (Hb%), Packed Cell Volume (PCV), Erythrocyte Sedimentation Rate (ESR) and Total Leukocyte Count (TLC) were also included in this investigation.

MATERIALS AND METHODS

The experiment was conducted in the Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University, Sylhet and Government Goat Development farm, Sylhet, Bangladesh was selected for this study. The research was carried out during the period of July to December, 2010. The following procedures were adopted for performing the experiment. Twenty goats of 12-13 months old are selected within the randomly sampling goats which were severely infected with gastrointestinal nematodiasis irrespective of the species of parasites involved. These twenty goats were randomly divided into four groups each comprising of five goats and marked as A, B, C and D.

Weekly EPG (eggs per gram) count was done on day 7th, 14th, 21st and 28th post treatment by McMaster egg counting technique. McMaster fecal egg count method described by [15] was used. With sterile syringe and needle maintaining aseptic condition, 5 ml of blood sample was collected from jugular vein of each goat and kept in vials containing anticoagulant (sodium- EDTA) and this was done on day of 0, 7th, 14th, 21st and 28th during experimental period. Blood and fecal samples were collected from each goat and after prescribing a proper identification tag it and were immediately brought to the Physiology and Pharmacology Laboratory, Sylhet, Bangladesh for fecal examination. The hematological parameters were examined in the laboratory of the Department of Physiology and Pharmacology, Sylhet, Bangladesh. Live weight gain of each group on recorded on day 0 and 28 using digital weight balance.

Goats of group A were treated with Vermic injection (Ivermectin 1%, Techno drugs Ltd. Bangladesh)

subcutaneously at the dose rate of 200µgkg⁻¹ body weight, group B were treated with tablet Levavet (Levamisole HCl, The ACME Laboratories Ltd, Bangladesh) orally at the dose rate of 7.5 mgkg⁻¹ body weight, group C were treated with tablet Almex-Vet (Albendazole, Square Pharmaceuticals Ltd, Bangladesh) orally at the dose rate of 7.5 mgkg⁻¹ body weight and goats of group D served as untreated control.

All the goats 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 goats 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 the day '28' of treatment and hematological parameters TEC, Hb, PCV, ESR and TLC were determined as per method by [6]. All the data were statistically analyzed by the computer using statistical package programmed MSTAT-C developed by [43] and following the standard methods by [51]. A one way ANOVA method was made by F variance test. The eggs of parasites were identified on the basis of morphological characteristics as described by [52] and then counted.

RESULTS AND DISCUSSION

The results of the comparative efficacy of ivermectin, levamisole HCl and albendazole based on fecal egg counts reduction on naturally infested goats are presented in (Table 1). In the treatment group A mean EPG (eggs per gram) count before treatment 314.00±17.78 and after treatment mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day were 43.20±2.03, 54.40±1.63, 46.00±2.92 and 41.60±1.44 respectively. The rate of reduction of mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day after treatment was 93.24%, 90.68%, 88.53% and 86.75% respectively. In conformity to the present findings, [25, 41, 53, 2, 31, 7, 62] observed similar results in goat. Likewise [1, 21, 35] reported similar findings in sheep. Similar results have also been stated by some researchers, [48] in sheep and [26] in buffaloes. It seems that a few works was carried out previously to determine the efficacy of these anthelmintics in Bangladesh. It occurred due to the potency of different anthelmintic against gastrointestinal nematodiasis in goats.

In treatment group B, the pre-treatment mean EPG (eggs per gram) count was 288.00±8.00 and the post-treatment mean EPG (eggs per gram) count values at 7th, 14th, 21st and 28th day were 70.60±1.63, 83.60±2.32, 65.00±0.95 and 43.00±2.00 respectively. The rate of reductions were significantly increased to the extent of mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day after treatment were 94.49%, 90.97%, 87.43% and 85.07% respectively. The result is more or less similar by earlier reported [4, 50, 42, 56, 57, 60]. [22] Reported that levamisole at the dose rate of 8.5 mgkg⁻¹ body weight was 100% effective in goats

naturally infected with various gastrointestinal nematodes. The findings of the present study are more or less similar to the earlier researchers.

respectively and the rate of EPG (eggs per gram) count was increased. The efficacies of the products were evaluated on the basis of the percentage of

Table 1. Efficacy of ivermectin, levamisole HCl and albendazole on egg count EPG (eggs per gram) in gastrointestinal nematodiasis in goats

Group	Treatment	Pre-treatment		Post-treatment						
		Day 0	Day 7	Day 14	Day 21	Day 28				
		Mean ±SE	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%
G _A	Inj. Vermic®	314.00	43.20	93.24	54.40	90.68	46.00	88.53	41.60	86.75
		± 17.78	± 2.03**		± 1.63**		± 2.92**		± 1.44**	
G _B	Levavet®	288.00	70.60	94.49	83.60	90.97	65.00	87.43	43.00	85.07
		± 8.00	± 1.63**		± 2.32**		± 0.95**		± 2.00**	
G _C	Almex-vet®	306.00	82.20	97.14	65.00	95.76	47.00	93.64	22.00	92.81
		± 8.72	± 0.86**		± 2.24**		± 4.64**		± 1.22**	
G _D	Control group	295.00	314.00	0.34	334.00	2.03	354.00	4.75	379.00	9.15
		± 5.48	± 5.10**		± 3.32**		± 3.32**		± 9.70**	

** = Significant at 1 percent level (p<0.01 and p>0.05)

In treatment group C, the pre-treatment mean EPG (eggs per gram) count was 306.00±8.72 and the post-treatment mean EPG (eggs per gram) count values at 7th, 14th, 21st and 28th day were 82.20±0.86, 65.00±2.24, 47.00±4.64 and 22.00±1.22 respectively. The rate of reductions were significantly increased to the extent of mean EPG (eggs per gram) on 7th, 14th, 21st and 28th day after treatment were 86.12%. This result in conformity with the earlier workers, [17, 40, 16]. [37] Studied the comparative efficacy of albendazole, albendazole plus rafoxanide combination, ivermectin and doramectin. This study was conducted in Pashmina goats infested with *Haemonchus* spp and maintained at high altitude (>2350 m above sea level).

reduction in mean egg count compared to the mean egg count per gram of feces. A significant (p<0.01) reduction of EPG (eggs per gram) count was found on 7th, 14th, 21st and 28th day of treated goat of group A, B and C respectively.

The effects of three anthelmintics ivermectin, levamisole HCl and albendazole on TEC of goats for 28 days at 7 days interval was shown in (Table 2). The pre-treatment values of TEC (million/cu. mm of blood) were 7.98±0.06, 8.06±0.05 and 7.96±0.09 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of TEC were increased up to 8.10±0.05, 8.08±0.06 and 8.24±0.06 in the goats of group A, B and C respectively. The mean value of TEC in control

Table 2. Efficacy of ivermectin, levamisole HCl and albendazole on hematological parameters Total Erythrocyte Count (TEC)

Group	Treatment	Pre-treatment		Post-treatment						
		Day 0	Day 7	Day 14	Day 21	Day 28				
		Mean ±SE	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%
G _A	Inj. Vermic®	7.98±0.06	8.16±0.05**	2.21	8.14±0.05**	1.97	8.12±0.09**	1.72	8.10±0.05**	1.48
G _B	Levavet®	8.06±0.05	8.10±0.07**	0.49	8.10±0.07**	0.49	8.12±0.06**	0.74	8.08±0.06**	0.25
G _C	Almex-vet®	7.96±0.09	8.10±0.07**	1.73	7.98±0.08**	0.25	8.14±0.06**	2.21	8.24±0.06**	3.40
G _D	Control group	7.90±0.08	7.84±0.04**	0.76	7.48±0.10**	5.32	7.56±0.06**	4.30	7.29±0.12**	7.72

** = Significant at 1 percent level (p<0.01 and p>0.05)

Mean body weight of untreated control group D (day 0) EPG (eggs per gram) count was 295.00±5.48 and on the EPG (eggs per gram) count values at 7th, 14th, 21st and 28th day were 314.00±5.10, 334.00±3.32, 354.00±3.32 and 379.00±9.70

group (group D) was 7.90±0.08 but the mean values of TEC started to decrease on 28th day and recorded as 7.29±0.12. The mean value of TEC was significantly increased (p<0.01 and p>0.05) on 28th day of the treatment of three anthelmintics. These

results are more or less similar with the earlier researchers, [26, 38, 34] in goat.

Volume (PCV %) of goats for 28 days at 7 days interval was shown in (Table 4). The pre-treatment

Table 3. Efficacy of ivermectin, levamisole HCl and albendazole on hematological parameters Hemoglobin (Hb %) in goat

Group	Treatment	Post-treatment								
		Pre-treatment			Day 7			Day 28		
		Day 0	Day 7	Day 14	Day 21	Day 28				
		Mean ±SE	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%
G _A	Inj. Vermic®	7.66±0.22	8.02±0.16**	4.49	8.36±0.09**	8.37	8.60±0.19**	10.93	8.82±0.25**	13.15
G _B	Levavet®	7.56±0.21	8.04±0.21**	5.97	8.10±0.40**	6.67	8.58±0.19**	11.89	8.88±0.20**	14.86
G _C	Almex-vet®	7.14±0.10	7.64±0.53**	6.54	8.10±0.51**	11.85	8.44±0.27**	15.40	9.04±0.36**	21.02
G _D	Control group	7.22±0.12	7.62±0.25**	-5.54	7.60±0.29**	-5.26	8.02±0.24**	-11.08	7.58±0.21**	-4.99

** = Significant at 1 percent level (p<0.01 and p>0.05)

The effects of three anthelmintics ivermectin, levamisole HCl and albendazole on Hemoglobin (Hb %) of goats for 28 days at 7 days interval was shown in (Table 3). The pre-treatment values of Hb (g %) were 7.66±0.22, 7.50±0.21 and 7.14±0.10 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of Hb (g %) were increased up to 8.82±0.25, 8.80±0.20 and 9.04±0.36 in the goats of group A, B and C respectively. The mean value of Hb (g %) in control group (group D) was 7.22±0.12 but the mean values of Hb (g %) started to increase on 28th day and recorded as 7.58±0.21. The mean value of Hb (g %) was significantly increased (p<0.01 and p>0.05) on 28th day of three anthelmintics treatment. Similar results have also been stated with the earlier researchers, [32, 26, 61] in goat.

values of PCV were 27.10±0.19, 27.13±0.10 and 27.30±0.62 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of PCV were increased up to 29.26±0.09, 29.04±0.13 and 29.04±0.05 in the goats of group A, B and C respectively. The mean value of PCV in control group (group D) was 27.37±0.27 but the mean values of PCV started to increase on 28th day and recorded as 27.39±0.06. The mean value of PCV was significantly increased (p<0.01 and p>0.05) on 28th day of three anthelmintics treatment. This result has are more or less similar with the report of [33] declined PCV value was observed in control group. Similar results have also been stated by the earlier workers [26, 54].

The effects of three anthelmintics ivermectin, levamisole HCl and albendazole on Erythrocyte Sedimentation Rate ESR (mm h⁻¹) of goats for 28

Table 4. Efficacy of ivermectin, levamisole HCl and albendazole on hematological parameters Packed Cell Volume (PCV %) in goat

Group	Treatment	Post-treatment								
		Pre-treatment			Day 7			Day 28		
		Day 0	Day 7	Day 14	Day 21	Day 28				
		Mean ±SE	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%
G _A	Inj. Vermic®	27.10±0.19	28.26±0.09**	4.10	28.52±0.18**	4.98	28.64±0.11**	5.38	29.26±0.09**	7.38
G _B	Levavet®	27.13±0.10	28.32±0.21**	4.22	28.44±0.19**	4.62	28.50±0.20**	4.82	29.04±0.13**	6.58
G _C	Almex-vet®	27.30±0.62	28.10±0.22**	2.85	28.16±0.06**	3.05	28.36±0.13**	3.74	29.04±0.05**	5.99
G _D	Control group	27.37±0.27	27.26±0.09**	0.41	27.18±0.12**	0.70	27.10±0.12**	0.99	27.39±0.06**	1.07

** = Significant at 1 percent level (p<0.01 and p>0.05)

The effects of three anthelmintics ivermectin, levamisole HCl and albendazole on Packed Cell

days at 7 days interval was shown in (Table 5). The initial control values of ESR (mm h⁻¹) were

0.14±0.02, 0.13±0.01 and 0.13±0.01 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of ESR (mm h⁻¹) were decreased up to 0.00±0.00, 0.00±0.00 and 0.00±0.00 in the goats of group A, B and C respectively. The mean value of ESR (mm h⁻¹) in

were decreased up to 7.79±0.03, 8.10±0.09 and 7.95±0.08 in the goats of group A, B and C respectively. The mean value of TLC in control group (group D) was 8.06±0.04 but the mean values of TLC started to increase on 28th day and recorded as 8.22±0.07. The mean value of TLC was

Table 5. Efficacy of ivermectin, levamisole HCl and albendazole on hematological parameters Erythrocyte Sedimentation Rate ESR (mm h-1) in goat

Group	Treatment	Post-treatment								
		Pre-treatment			Post-treatment					
		Day 0	Day 7		Day 14		Day 21		Day 28	
Mean ±SE	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%		
G _A	Inj. Vermic®	0.14±0.02	0.04±0.01*	71.01	0.00±0.00*	100	0.00±0.00*	100	0.00±0.00*	100
G _B	Levavet®	0.13±0.01	0.03±0.01*	73.02	0.00±0.00*	100	0.00±0.00*	100	0.00±0.00*	100
G _C	Almex-vet®	0.13±0.01	0.04±0.01*	71.25	0.00±0.00*	100	0.00±0.00*	100	0.00±0.00*	100
G _D	Control group	0.15±0.01	0.21±0.01*	29.81	0.31±0.04*	52.90	0.65±0.04*	77.68	1.12±0.05*	86.96

* = Significant at 5 percent level (p<0.05 and p>0.01)

control group (group D) was 0.15±0.01 but the mean values of ESR (mm h⁻¹) started to increase on 28th day and recorded as 1.12±0.05. The mean value of ESR (mm h⁻¹) was significantly decreased (p<0.05 and p>0.01) on 28th days of treatment. This result is similar to the reports of [13, 44, 37].

significantly decreased (p<0.05 and p>0.01) on 28th days of treatment. These present findings in agreement of the works with [38, 59, 34] in goat, [61, 34, 14] in sheep.

The mean initial body weight on day '0' of goats in group A, B and C were 14.38±0.16, 14.44±0.14 and 14.34±0.09 kg respectively. On the 28th day of the

The effects of three anthelmintics ivermectin,

Table 6. Efficacy of ivermectin, levamisole HCl and albendazole on hematological parameters Total Leukocyte Count (TLC) in goat

Group	Treatment	Post-treatment								
		Pre-treatment			Post-treatment					
		Day 0	Day 7		Day 14		Day 21		Day 28	
Mean ±SE	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%	Mean ±SE	%		
G _A	Inj. Vermic®	8.12±0.04	7.84±0.08*	3.45	7.84±0.05*	3.45	7.98±0.07*	1.72	7.92±0.06*	2.18
G _B	Levavet®	8.12±0.06	7.94±0.08*	2.22	7.92±0.07*	2.46	7.94±0.06*	2.22	7.96±0.07*	1.97
G _C	Almex-vet®	8.24±0.05	7.88±0.04*	4.37	7.98±0.06*	3.16	8.00±0.05*	2.91	8.06±0.04*	2.46
G _D	Control group	8.06±0.04	8.08±0.05*	0.25	8.10±0.07*	0.49	8.14±0.05*	0.98	8.22±0.07*	1.95

* = Significant at 5 percent level (p<0.05 and p>0.01)

levamisole HCl and albendazole on Total Leukocyte Count (TLC) of goats for 28 days at 7 days interval was shown in (Table 6). The pre-treatment values of TLC were 8.12±0.04, 8.12±0.06 and 8.24±0.05 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of TLC

post-treatment, the mean values of body weight were increased up to 14.68±0.14, 14.58±0.18 and 15.32±0.40 in the goats 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 goat

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

Table 7. Efficacy of ivermectin, levamisole HCl and albendazole on body weight (kg) gain/loss in goat

Groups	Treatment	Pretreatment		Post-treatment		Bodyweight of individual goat (kg)	Mean (%)
		Day 0		Day 28			
		Body weight (kg)	Body weight (kg)	% change			
G _A	Inj. Vermic®	14.38±0.16	14.68±0.14**	2.04	+3.20	+2.64	
G _B	Levavet®	14.44±0.14	14.58±0.18**	0.96	+2.80	+2.46	
G _C	Almex- vet®	14.34±0.09	15.32±0.40**	6.40	+3.60	+3.04	
G _D	Control group	14.30±0.05	14.30±0.03**	0.00	-1.60	-1.35	

** = Significant at 1 percent level (p<0.01 and p>0.05)

are supported by [27] in heifers. On the other hand, the body weight significantly decreased in untreated control group due to overload of parasites within the body of goat. The improvement percentage in goats of group A, B and C after 28th day was 2.04%, 0.96% and 6.40% respectively. In the control group (group D) body weight was reduces to the extent of -1.35% after 28th day (Table 7). Some earlier workers found improvement in body weight after treatment [36, 5, 63, 45, 55].

During the study of hematological parameters it was found that after treatment with Vermic (Ivermectin 1%, injectable formulation), Levavet (Levamisole HCl) and Almex-Vet (Albendazole) 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 2-6). 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 Almex-Vet (Albendazole) is a more effective drug against gastrointestinal nematodiasis in goats than that of Vermic (injectable Ivermectin) and Levavet (Levamisole HCl).

CONCLUSION

The findings of the present study reveal that *Haemonchus* spp, *Trichostrongylus* spp, *Cooperia* spp, *Oesophagostomum* spp, *Trichuris* spp, *Strongyloides* spp and mixed infections are prevalent in Bangladesh. Ivermectin (Vermic, injectable formulation), Levamisole (Levavet) and Albendazole (Almex-Vet) are effective for the reduction of EPG (eggs per gram) of gastrointestinal nematodes. This study indicated that Almex-Vet (Albendazole) are highly effective on egg count EPG (eggs per gram) and hematological parameters (TEC, Hb, PCV, ESR and TLC) in gastrointestinal nematodiasis in goats than that of Vermic (injectable Ivermectin) and Levavet (Levamisole HCl) during the experiment. These three anthelmintics have wide therapeutic index and are capable of killing or inhibiting egg production of gastrointestinal nematodes. The

infection in goat. Further studies are required to clarify the efficacy of the 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 gastrointestinal nematodiasis in goats. Further studies on anthelmintics pharmacokinetic and toxicity would be helpful.

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