

Original Research

Comparative efficacy of ivermectin (inj. vermic), fenbendazole (peraclear) and albendazole (almex-vet) against gastrointestinal nematodiasis in goats

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ABSTRACT:

This study aimed to evaluate the efficacy of ivermectin, fenbendazole and albendazole against gastrointestinal nematodes in naturally infected goats of government goat development farm, Sylhet, Bangladesh. The study included 50 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 13-15 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 Limited, Bangladesh) and two solid fenbendazole, albendazole (7.5 mgkg⁻¹ body weight, orally) preparations (Techno Drugs Limited 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 faecal 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 were recorded on day 28 following the treatments. The results of the comparative efficacies of different anthelmintic of ivermectin was 100%, followed by fenbendazole 95.33% and albendazole 90.11%. McMaster fecal egg counting method disclose the percentage of *Haemonchus* spp. (15.38%), with *Trichostrongylus* spp, *Strongyloides* spp., and *Cooperia* spp. also present. The body weight of the treated animals were slightly increased which were significant ($p < 0.05$). After treatment with ivermectin, fenbendazole and albendazole, Total Erythrocyte Count (TEC), Hemoglobin (Hb) content and Packed Cell Volume (PCV) were increased significantly ($p > 0.05$ and $p < 0.01$) in goats but Erythrocyte Sedimentation Rate (ESR) and Total Leukocyte Count (TLC) were decreased significantly ($p > 0.05$) in all treated goat and body weight was increased significantly ($p < 0.01$) on day 28. The farm management practices along with results of the present study revealed the efficacy of multiple anthelmintics against gastrointestinal nematodes in goats. Additional detailed studies are required to clarify the current status of the efficacy of the anthelmintics widely used in different agro ecologies, animal species, and livestock management systems in Bangladesh.

Keywords:

Comparative efficacy, gastrointestinal nematodes, goats and Sylhet.

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INTRODUCTION

Goats are reared mainly in the rural areas of Bangladesh. The climatic condition of Bangladesh is favourable to the ecological conditions suitable for parasites of which the helminth parasite predominates. 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 (Jabbar and Green, 1983), helminthiasis especially gastrointestinal nematodiasis overwhelming a severe havoc on health and production (Rehman *et al.*, 2009, Perry *et al.*, 2002; Sahlu *et al.*, 2009) throughout the world due to impacts on economy also (Silvestre *et al.*, 2000) and market value of the living animals (Islam, 1985) with a high rate of anthelmintic resistance prevalence (Howell *et al.*, 2008; Kaplan *et al.*, 2004). The anthelmintic activities and therapy of ivermectin, fenbendazole and albendazole have been studied (Dale and Haylett, 2004). Ivermectin produces flaccid paralysis of parasites by acting as an agonist of the neurotransmitter Gamma Amino Butyric Acid (GABA), thereby disrupting GABA-mediated Central Nervous System (CNS) neurosynaptic transmission (Dacasto and Cocuzza, 1995), and albendazole act by inhibiting tubulin polymerization, whereas oxytocanide lowers the essential ATP through uncoupling oxidative phosphorylation (Einsteinm *et al.*, 1994). Most of the anthelmintics used in this country are being imported and there is no data available about efficacy, safety, toxicity and dose regime in livestock in Bangladesh. Goat rearing is very popular and treated locally as “cow of poor people” in Bangladesh. Agriculture is the economic backbone of Bangladesh and approximately 80% people depend on it directly or indirectly for their subsistence. The livestock is an important sub-sector which is considered to be the backbone of agriculture in Bangladesh (BBS, 1998). Among livestock, the population in Bangladesh is currently estimated to

comprise 20.75 million goats (DLS, 2007). We can prevent and control the parasitic diseases by using a routine prophylactic anthelmintics measurement. This present study was aimed to evaluate the efficacy of three modern anthelmintics Vermic injection (Ivermectin), Peraclear (Fenbendazole) and Almex-Vet (Albendazole) against gastrointestinal nematodiasis in goats on the basis of EPG count and their effects on hematological parameters like TEC, Hb, PCV, ESR, TLC and body weight gain/loss were included in this investigation.

MATERIALS AND METHODS

The experiment was conducted in the Department of Pharmacology and Toxicology, Sylhet Agricultural University, Sylhet. Sylhet Government Goat Development farm, Sylhet was selected for this study. The research was carried out during the period of January to June, 2014. The following procedures were adopted for performing the experiment. Twenty goats of 13-15 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.

Blood and faecal samples were collected from each goat and after prescribing a proper identification tag it and was immediately brought to the Pharmacology and Toxicology Laboratory, Sylhet, Bangladesh for faecal examination. McMaster faecal egg count method described by Gordong and Whitlock (1939) was used. The haematological parameters were examined in the laboratory of the Department of Pharmacology and Toxicology, Sylhet, Bangladesh.

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 Peraclear (Fenbendazole, Techno Drugs, Ltd,

Bangladesh) orally at the dose rate of 7.5 mg/kg-1 body weight, group C were treated with tablet Almed-Vet (Albendazole, Square Pharmaceuticals Ltd, Bangladesh) orally at the dose rate of 7.5 mg/kg-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 faecal samples were collected from the treated and control groups of goats on 7th, 14th, 21st and 28th day of treatment to investigate the faecal egg count. The blood samples were collected from the treated and untreated control groups on the day '28' of treatment and haematological parameters TEC, Hb, PCV, ESR and TLC were determined as per method by Coffin (1995). All the data were statistically analyzed by the computer using statistical package programmed MSTAT-C developed by Russel (1996) and following the standard methods by Snedecor and Cochran (1967). The eggs of parasites were identified on the basis of morphological characteristics as described by Soulsby (1986) and then counted.

RESULTS AND DISCUSSION

To investigate the efficacy of gastrointestinal nematodiasis in naturally infected goats of government goat farm, Sylhet, Bangladesh, a total of 50 goat breed were diagnosed by fecal examinations of which 30 were naturally infected and randomly selected 20 on the basis of their weight and egg count and gastrointestinal nematodiasis were significantly higher ($p < 0.01$). Effects of ivermectin, fenbendazole and albendazole on egg per gram (EPG) in gastrointestinal nematodiasis in goats. The results of the comparative efficacy of ivermectin, fenbendazole and albendazole based on fecal egg counts reduction on naturally infested goats are presented in (Table 1). In the treatment group A mean EPG count before treatment 815.00 ± 10.22 and after treatment mean EPG on 7th, 14th, 21st and 28th day were 0, 0, 0, and 0 respectively. The rate of reduction of mean EPG on 7th,

14th, 21st and 28th day after treatment were 100%. In conformity to the present findings, Islam *et al.*, (1994), Ponikarov (1989), Shastri (1989), Baggerwal *et al.*, (1991), Mukherjee *et al.*, (1994), Docastro and Cocuzza (1995) and Yadav *et al.*, (1996) observed similar results in goat. Likewise Amin *et al.*, (2005), Hosseinei *et al.*, (2000) and Praslicka *et al.*, (1995) reported similar findings in sheep. Similar results have also been stated by some researchers, Stevenson *et al.*, (2002) in sheep and Islam *et al.*, (2003) in buffaloes. It seems that a few work was carried out previously to determine the efficacy of this anthelmintics in Bangladesh. It occurred due to the potency of different anthelmintic against gastrointestinal nematodiasis in goats. This study revealed that ivermectin is a most effective anthelmintics against gastrointestinal nematodiasis in goats.

In treatment group B, the pre-treatment mean EPG count was 750.00 ± 12.09 and the post-treatment mean EPG count values at 7th, 14th, 21st and 28th day were 140.00 ± 4.25 , 100.00 ± 2.51 , 60.00 ± 5.61 , and 35.00 ± 3.15 respectively. The rate of reductions were significantly increased to the extent of mean EPG on 7th, 14th, 21st and 28th day after treatment were 95.33%. The result is more or less similar by earlier reported Beck *et al.*, (1971); Sharma and Jagadish (1991); Prodhan *et al.*, (1993); Thejeomooethy *et al.*, (1995); Vesconcelos *et al.*, (1995) and Williams and Broussard (1995). Haq *et al.*, (1984) reported that fenbendazole at the dose rate of 5 mg/kg-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.

In treatment group C, the pre-treatment mean EPG count was 708.00 ± 7.50 and the post-treatment mean EPG count values at 7th, 14th, 21st and 28th day were 171.00 ± 5.41 , 133.00 ± 6.63 , 106.00 ± 5.46 , and 70.00 ± 5.32 respectively. The rate of reductions were significantly increased to the extent of mean EPG on 7th, 14th, 21st and 28th day after treatment were 90.11%. This

result in conformity with the earlier workers, Guha *et al.*, (1996), Pomroy *et al.*, (1998), Guha and Banerjee (1987). Ram *et al.*, (2007) 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).

Mean body weight of untreated control group D (day 0) EPG count was 911.00 ± 7.29 and on the EPG count values at 7th, 14th, 21st and 28th day were 930.00 ± 9.13 , 950.00 ± 8.98 , 970.00 ± 8.98 and 995.00 ± 5.40 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 per gram of feces. A significant ($p < 0.01$) reduction of EPG 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, fenbendazole 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 8.16 ± 0.10 , 8.18 ± 0.12 and 8.25 ± 0.14 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 13.11 ± 0.12 , 12.27 ± 0.12 and 12.11 ± 0.06 in the goats of group A, B and C respectively. The mean value of TEC in control group (group D) was 8.20 ± 0.12 but the mean values of TEC started to decrease on 28th day and recorded as 7.48 ± 0.15 . The mean value of TEC was significantly increased ($p > 0.05$ and $p < 0.01$) on 28th day of the treatment of three anthelmintics. These results are more or less similar with the earlier researchers, Islam *et al.*, (2003), Richard *et al.*, (1990) and Preston and Allonby (1978) in goat.

The pre-treatment values of Hb (g %) were 7.94 ± 0.09 , 8.33 ± 0.08 and 8.34 ± 0.16 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 10.21 ± 0.07 , 10.06 ± 0.13 and 10.16 ± 0.13 in the goats of group A, B and C respectively. The mean value of Hb (g %) in control group (group D) was 8.91 ± 0.15 but the mean values of Hb (g %) started to decrease on 28th day and recorded as 7.93 ± 0.06 . The mean value of Hb (g %) was significantly increased ($p > 0.05$ and $p < 0.01$) on 28th day of three anthelmintics treatment. Similar results have also been stated with the earlier researchers, Mukherjee (1992), Islam *et al.*, (2003) and Yousif *et al.*, (1988) in goat.

Table 1. Effects of different anthelmintics on egg count (EPG) in goats

Groups	Treatment	Pretreatment			Post-treatment			% Reduction at day "28"
		Day 0	Day 7	Day 14	Day 21	Day 28		
G _A	Inj. Vermic ^(R)	815.00 ± 010.22	0	0	0	0	100	
G _B	Peraclear ^(R)	750.00 ± 012.09	140.00 ± 004.25**	100.00 ± 002.51**	60.00 ± 05.61**	35.00 ± 03.15**	95.33	
G _C	Almex-vet ^(R)	708.00 ± 007.50	171.00 ± 005.41**	133.00 ± 006.63**	106.00 ± 005.46**	70.00 ± 05.32**	90.11	
G _D	Control group	911.00 ± 007.29	930.00 ± 009.13**	950.00 ± 008.98**	970.00 ± 008.98**	995.00 ± 005.40**	-	

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

The pre-treatment values of PCV were 27.76±0.12, 28.07±0.12 and 28.00±0.10 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 30.02±0.08, 30.16±0.06 and 29.32±0.13 in the goats of group A, B and C respectively. The mean value of PCV in control group (group D) was 27.96±0.08 but the mean values of PCV started to decrease on 28th day and recorded as 26.90±0.01. The mean value of PCV was significantly increased (p>0.05 and p<0.01) on 28th day of three anthelmintics treatment. This 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 Islam *et al.*, (2003) and Tariq *et al.*, (2010).

The initial control values of ESR (mm h-1) were 0.12±0.01, 0.10±0.01 and 0.11±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 increased up to 0, 0 and 0 in the goats of group A, B and C respectively. The mean value of ESR (mm h-1) in control group (group D) was 0.11±0.01 but the mean values of ESR (mm h-1) started to increase on 28th day and recorded as 0.19±0.01. The mean value of ESR (mm

h-1) was significantly decreased (p<0.05 and p>0.01) on 28th days of treatment. This results is similar to the reports of Gillespie *et al.*, (2010), Rehman *et al.*, (2009) and Ram *et al.*, (2007).

The pre-treatment values of TLC were 8.12±0.04, 8.12±0.06 and 8.24±0.06 in the goats of group A, B and C respectively. On the 28th day of the post-treatment, the mean values of TLC were increased up to 7.92±0.06, 7.96±0.07 and 8.06±0.04 in the goats of group A, B and C respectively. The mean value of TLC in control group (group D) was 7.29±0.12 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 significantly decreased (p<0.05 and p>0.01) on 28th days of treatment. These present findings in agreement of the works with Richard *et al.*, (1990), Windon (1990) and Preston and Allonby (1978) in goat, Yousif *et al.*, (1988), Preston and Allonby (1978) and Gray *et al.*, (1987) 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 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

Table 2. Haematological findings of control and study groups at day 28 post treatment

Groups	Treatment	Pre-treatment Day 0					Post-treatment Day 28				
		TEC	Hb	PCV	ESR	TLC	TEC	Hb	PCV	ESR	TLC
G _A	Inj. Vermic (^R)	8.16	7.94	27.76	0.12	8.12	13.11	10.21	30.02	0	7.92
		±	±	±	±	±	±	±	±	±	±
G _B	Peraclear(^R)	0.10	0.09	00.12	0.01	0.04	00.12**	00.07**	00.08*		0.06**
		±	±	±	±	±	±	±	±	0	±
G _C	Almex-vet (^R)	8.18	8.33	28.07	0.10	8.12	12.27	10.06	30.16	0	7.96
		±	±	±	±	±	±	±	±	±	±
G _D	Control group	0.12	0.08	00.12	0.01	0.06	00.12**	00.13**	00.06*		0.07**
		±	±	±	±	±	±	±	±	±	±
G _C	Almex-vet (^R)	8.25	8.34	28.00	0.11	8.24	12.11	10.16	29.32	0	8.06
		±	±	±	±	±	±	±	±	±	±
G _D	Control group	0.14	0.16	00.10	0.01	0.06	00.06**	00.13**	00.13*		0.04**
		±	±	±	±	±	±	±	±	0.19	±
G _D	Control group	8.20	8.91	27.96	0.11	7.29	7.48	7.93	26.90	0.19	8.22
		±	±	±	±	±	±	±	±	±	±
G _D	Control group	0.12	0.15	00.08	0.01	0.12	0.15**	0.06**	00.10*	0.01	0.07**
		±	±	±	±	±	±	±	±	±	±

TEC = Total erythrocytes count; hb = Haemoglobin; 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)

weight increased significantly ($P < 0.05$) 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, fenbendazole and albendazole treated goat 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 goat. The improvement percentage in goats of group A, B and C after 28th day was 2.04%, 0.96% and 6.40% respectively. The body weight almost similar to their pre-treatment values. In the control group (group D) body weight was reduces to the extent of 0.00% after 28th day (Table 3). Some earlier workers found improvement in body weight after treatment Pandit *et al.*, (2009), Chand-Thakuri *et al.*, (1994), Zajac *et al.*, (1992), Rossanigo *et al.*, (1993) and Thedford *et al.*, (1990).

During the study of haematological parameters it was found that after treatment with Vermic (injectable formulation), Peraclear (Fenbendazole) 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). The mean value of Hb, PCV and TEC were decreased and ESR, TLC values were increased in untreated naturally parasitised control group. This study indicated that Vermic (injectable Ivermectin) is a more effective drug against

gastrointestinal nematodiasis in goats than that of Almex-Vet (Albendazole) and Peraclear (Fenbendazole).

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), Fenbendazole (Peraclear) and Albendazole (Almex-Vet) are effective for the reduction of EPG of gastrointestinal nematodes. This study indicated that Vermic (Ivermectin) are highly effective on egg count (EPG) and haematological parameters (TEC, Hb, PCV, ESR and TLC) in gastrointestinal nematodiasis in goats than that of Almex-Vet (Albendazole) and Peraclear (Fenbendazole) during the experiment. These three anthelmintics have wide therapeutic index and are capable of killing or inhibiting egg production of gastrointestinal nematodes. 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 goat. Further studies are required to clarify the efficacy of the anthelmintics widely used in different agroecologies, 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

Table 3. Bodyweight (kg) gain/loss (comparative efficacy) of goat in various treatment days

Groups	Treatment	Pretreatment	Post-treatment		Bodyweight of individual goat (kg)	Mean (%)
		Day 0 Body weight (kg)	Day 28 Body weight (kg)	% change		
G _A	Inj. Vermic ^(R)	14.38±0.16	14.68±0.14*	2.04	+3.20	+2.64
G _B	Peraclear ^(R)	14.44±0.14	14.58±0.18*	0.96	+2.80	+2.46
G _C	Almex-vet ^(R)	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 5 percent level ($p < 0.05$)

and toxicity would be helpful.

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