

Evaluation of anthelmintic efficacy of triclabendazole, nitroxynil and albendazole against naturally acquired fascioliasis in cattle of Bangladesh with special reference to its residual effect

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Abstract

This study aimed to evaluate the efficacy of triclabendazole, nitroxynil and albendazole against fascioliasis in naturally infected cattle of government dairy farm, Sylhet, Bangladesh. The study included 50 cattle breed of which 30 were naturally infected and randomly selected 20 based on their weight and egg count. Twenty cattle of 2-3 years old irrespective of sex infested with fascioliasis were selected for this experiment and randomly divided into four equal groups (group A, B, C and D) where each group consisted of 5 cattle and cattle of group D were kept as control group. One injectable nitroxynil (10 mg/kg-1 body weight, S/C) preparations (Renata Ltd. Bangladesh) and two solid triclabendazole, albendazole (12 mg/kg-1, 15 mg/kg-1 body weight, orally) preparations (Novartis Ltd. and Square Pharmaceuticals Ltd. Bangladesh) were used for positive control of fascioliasis as group A, B and C. Cattle 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 therapeutic efficacy was evaluated through determination of parasitic prevalence, body weight gain/loss and hematological findings. Pre and post-treatment EPG (eggs per gram) values were recorded, and efficacies compared. The results showed that the efficacy of nitroxynil was 92.57%, followed by triclabendazole 91.55% and albendazole 84.53%, which were significant ($p < 0.01$). The observed differences in efficacy between these three brands of anthelmintics were most likely due to variations either in quality or the administered doses. The body weight of the treated animals was increased, which were significant ($p < 0.01$). After treatment triclabendazole, nitroxynil 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 cattle but Erythrocyte Sedimentation Rate (ESR) and Total Leukocyte Count (TLC) were decreased significantly ($p < 0.05$ and $p > 0.01$) in all treated cattle 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 fascioliasis in cattle. 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; fascioliasis; cattle; Sylhet.

1. Introduction

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 22.87 million cattle GOB, DLS (2007). The agro-ecological and geo-climatic condition of Bangladesh favors high prevalence of parasitic infestation. Parasitism is the major cause hindering the development of livestock population in the country Shahiduzzaman et al. (1999). Parasites communities in snails are affected by numerous internal and external host factors Esch et al. (2001). Fascioliasis is one of the major parasitic diseases of ruminants, which affect the liver and gall bladder of cattle of Bangladesh Qadir (1981). Fascioliasis is wide spread in the country affecting 60 percent of cattle Bhuiyan (1970). The mortality rates are 5% due to fascioliasis infestation in cattle in Bangladesh BLRI (2006). The direct effects of this parasitic diseases is also associated with anemia and gastroenteritis resulting loss of body weight, stunted growth, diarrhea, etc. that greatly hamper the nor

mal growth and production, mortality, decreased milk, meat, wool, hide production, draft power, market value of animals, infertility and condemnation of carcasses during meat inspection and especially zoonotic impact on human health are considerably greater Baker and Muller (1988). Among the helminthes, trematode parasites of ruminant livestock have a worldwide distribution and even have zoonotic importance Rafique et al. (2009). 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 Waller (2006). The present investigation was aimed to evaluate the comparative efficacy of modern anthelmintics Fasinex (Triclabendazole), Nitronex injection (Nitroxynil) and Almex-Vet (Albendazole) against fascioliasis in cattle based on EPG count and their effects on hematological parameters like TEC, Hb, PCV, ESR, TLC and body weight gain/loss in fascioliasis in cattle were included in this investigation.

2. Materials and methods

The experiment was conducted in the Department of Pharmacology and Toxicology, Sylhet Agricultural University, Sylhet and Sylhet Government Dairy farm, Sylhet, Bangladesh was selected for this study. The research was carried out during the period of July to December, 2013. The following procedures were adopted for performing the experiment. Twenty cattle of 2-3 years old are selected within the randomly sampling cattle which were severely infected with fascioliasis irrespective of the species of parasites involved. These twenty cattle were randomly divided into four groups each comprising of five cattle and marked as A, B, C and D.

Blood and fecal samples were collected from each cattle and after prescribing a proper identification tag it and were immediately brought to the Pharmacology and Toxicology Laboratory, Sylhet, Bangladesh for faecal examination. Weekly EPG count was done on day 7th, 14th, 21st and 28th post treatment by McMaster egg counting technique. McMaster fecal egg count method described by Gordong and Whitlock (1939) was used. With sterile syringe and needle maintaining aseptic condition, 5 ml of blood sample was collected from jugular vein of each cattle 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 Pharmacology and Toxicology, Sylhet, Bangladesh. Live weight gain of each group on recorded on day 0 and 28 using digital weight balance.

Cattle of group A were treated with tablet Fasinex (Triclabendazole, Novartis Ltd. Bangladesh) orally at the dose rate of 12 mgkg⁻¹ body weight, group B was treated with Nitronex injection (Nitroxynil, Renata Ltd. Bangladesh) subcutaneously at the dose rate of 10 mgkg⁻¹ body weight. Group C was treated with tablet Almex-Vet (Albendazole, Square Pharmaceuticals Ltd. Bangladesh) orally at the dose rate of 15 mgkg⁻¹ body weight and cattle of group D served as untreated control.

All the cattle 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 cattle 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 hematological parameters, TEC, Hb, PCV, ESR and TLC were determined as per method by Coffin (1995). All the data were statistically analysed following the standard methods by using student "T" test Snedecor and Cochran (1978). The eggs of parasites were identified based on morphological characteristics as described by Soulsby (1986) and then counted.

3. Results

In this study the cattle of group A were treated with fasinex (triclabendazole) at the dose rate of 12 mgkg⁻¹ body weight orally and the rate of reduction of EPG was 91.55% on the 28th day. This result is in agreement with the earlier researchers. The cattle of group B were treated with nitronex (injectable nitroxynil) at the dose rate of 10 mgkg⁻¹ body weight subcutaneously and the rate of reduction on EPG on the 28th day was 92.57%. This result was found by earlier workers. The cattle of group C were treated with almex-Vet (albendazole) at the dose rate of 15 mgkg⁻¹ body weight orally and the rate of reduction in EPG on the 28th day was 84.53% (Table 1).

The similar findings were also reported by Babicek et al. (1993), Coles and Stafford (2001) in sheep. In untreated naturally parasitized control group D the mean EPG was 290.00 ± 7.07 at '0' day and at 7th, 14th, 21st and 28th days were 302.00 ± 8.00, 314.00 ± 7.48, 336.00 ± 7.48 and 338.00 ± 5.83 and the rate of infection was increased. During the study of hematological parameters it was found that after treatment with fasinex (triclabendazole), nitronex (injectable formulation) and almex-Vet (albendazole) TEC, Hb and PCV were significantly (p<0.01 and p>0.05) increased and on the other hand, ESR was decreased in treated groups (Table 2).

Table 1: Effects of different anthelmintics on egg count (EPG) in cattle

Groups	Treatment	Pretreatment		Post-treatment			% Reduction at day "28"
		Day 0	Day 7	Day 14	Day 21	Day 28	
GA	Fasinex®	289.00	95.00	65.00	45.00	25.00	91.55
		± 7.48	± 5.80**	± 4.25**	± 2.90**	± 1.88**	
GB	Inj. Nitronex®	276.00	87.00	63.00	48.00	20.00	92.57
		± 8.72	± 3.30**	± 2.20**	± 4.65**	± 1.25**	
GC	Almex- vet®	272.00	102.00	85.00	60.00	23.00	84.53
		± 8.00	± 2.90**	± 3.50**	± 1.85**	± 2.05**	
GD	Control group	295.00	300.00	300.00	306.00	335.00	23.25
		± 7.07	± 8.30**	± 7.45**	± 7.45**	± 5.80**	

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

Table 2: Hematological findings of control and study groups 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
GA	Fasinex®	8.60	9.40	30.50	1.18	8.25	9.40	10.70	32.20	0.87	8.00
		± 0.09	± 0.40	± 0.29	± 0.07	± 0.07	± 0.05**	± 0.25**	± 0.41**	± 0.06**	± 0.04**
GB	Inj. Nitronex®	8.40	9.20	30.00	1.20	8.20	9.20	10.80	31.80	0.90	8.00
		± 0.13	± 0.68	± 0.35	± 0.04	± 0.04	± 0.06**	± 0.37**	± 0.33**	± 0.04**	± 0.05**
GC	Almex- vet®	8.42	9.50	29.80	1.18	8.15	9.90	10.80	31.70	0.87	7.98
		± 0.08	± 0.40	± 0.62	± 0.07	± 0.04	± 0.07**	± 0.20**	± 0.53**	± 0.07**	± 0.04**
GD	Control group	8.50	9.60	29.30	1.18	7.88	7.56	8.70	28.40	1.28	8.55
		± 0.11	± 0.46	± 0.66	± 0.07	± 0.08	± 0.09**	± 0.37**	± 0.67**	± 0.04**	± 0.04**

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)

The live weight gain of cattle in group A, group B, group C recorded at '0' day and 28th day and the percentage of improvement of body weight in kilogram were 2.12%, 2.42% and 1.95% respectively and in control group it was reduced by 1.08% (Table 3).

Table 3: Body weight (Kg) gain/loss (comparative efficacy) of cattle in various treatment days

Groups	Treatment	Pre-treatment	Post-treatment		Bodyweight of individual goat (kg)	Mean (%)
		Day 0 Body weight (kg)	Day 28 Body weight (kg)	% change		
GA	Fasinex®	152.20	155.40	2.12	+3.20	+2.64
		± 3.72	± 3.97**			
		149.60	153.20			
GB	Inj. Nitronex®	± 5.36	± 5.42**	2.42	+3.60	+3.04
		144.80	147.60			
		± 3.58	± 3.71**			
GC	Almex- vet®	149.20	147.60	1.95	+2.80	+2.46
		± 4.18	± 4.25**			
		147.60	147.60			
GD	Control group	± 4.18	± 4.25**	1.08	-1.60	-1.35
		147.60	147.60			
		± 4.18	± 4.25**			

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

4. Discussion

To investigate the efficacy of fascioliasis in naturally infected cattle of government dairy farm, Sylhet, Bangladesh, a total of 50 cattle 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 fascioliasis were significantly higher (p <0.01). Gupta et al. (2004) and Islam KS (1985) reported the 100% efficacy of nitroxylin (Inj. nitronex) against fascioliasis in cattle at the dose rate of 10mgkg-1 body weight. Ponikarov (1989) reported 100% efficacy of nitroxylin (Inj. nitronex) at the dose rate of 12mgkg-1 body weight when given as a subcutaneous injection against fascioliasis in cattle. Shastri (1989) reported 91.55% and 84.53% efficacy of triclabendazole (fasinex) and albendazole (almex-Vet) against fascioliasis in cattle. This findings also observed by Stanfield et al. (1987), Sanchez et al. (1988), Tibbo (2000), Gaasenbeek et al. (2001). This findings support the earlier works of Qadir (1984), Misra et al. (1987) and Gupta et al. (1989) in cattle. The present findings was also in agreement with the work of Richards (1990), Alam et al. (1995), Asaduzzaman (1998), Sahoo et al. (2002), Hanif et al. (2003) and Gupta et al. (2004) in cattle. Haq et al. (1984) reported that triclabendazole at the dose rate of 12 mgkg-1 body weight was 91.55% effective in goats naturally infected with fascioliasis in cattle. The present findings were also in agreement with the work Singh et al. (1993), Coles and Stafford (2001) in cattle. Singh et al. (1994) and Hossain (1997) observed similar results in Goats. Similar results have also been stated by some researchers Gupta and Singh (2002) in cattle, Mohammad et al. (1985), Gupta and Singh (2002) in Buffalo and Zurliiski (1987) in Pig. Pomroy et al. (1988) reported that albendazole either at the dose rate of 12 mgkg-1 repeated after 24 hours or as a single dose rate of 14 mgkg-1 body weight was >99% effective in naturally infected cattle. Guha and Banerjee (1987) indicated that albendazole at the dose rate of 15 mgkg-1 body weights on cattle showed 100% effect. Findings of the present study reasonably agreed with the findings of the above mentioned authors. The findings was also in agreement with the works of Richards et al. (1990), Waruiru et al. (1994), Sahoo et al. (2002) and Gupta and Singh (2002). Likewise, Prasad et al. (2001) and Gupta and Singh (2002) observed similar results in buffaloes. TLC were decreased significantly (p<0.01) in all treated cattle and body weight increased significantly (p<0.01). It was seen that TEC, Hb and PCV were increased in treated group and on the other hand, ESR and TLC values were decreased on post treatment days. The mean value of TEC, Hb and PCV were decreased and ESR, TLC values were increased in untreated naturally parasitized control group. These findings are in agreement with the other researchers of Mason and Offer (2004), Kamruzzaman (2004), Widjajanti et al. (2001), Alam (1997) and Hanif et al. (2003) in cattle. The body weight

was increased significantly (p<0.01) after fasinex, nitronex and almex-Vet treatment in group A, B and C respectively. These findings are more or less similar to the findings of Mason and Offer (2004), Kamruzzaman (2004), Mcconville et al. (2006) and Richards et al. (2009). This study indicated that nitronex (injectable nitroxylin) is a more effective drug against fascioliasis in cattle than that of fasinex (triclabendazole) and almex-Vet (albendazole).

5. Conclusion

The findings of the present study reveal that fascioliasis infestations are prevalent in Bangladesh. Fasinex (triclabendazole), nitronex (injectable nitroxylin) and albendazole (almex-Vet) are effective for the reduction of EPG of fascioliasis in cattle. This study indicated that nitronex (nitroxylin) are highly effective on egg count (EPG) and hematological parameters (TEC, Hb, PCV, ESR and TLC) in fascioliasis in cattle than that of Fasinex (Triclabendazole) and Almex-Vet (Albendazole) during the experiment. These three anthelmintics have wide therapeutic index and are capable of killing or inhibiting egg production of fascioliasis. 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 cattle. 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 fascioliasis in cattle. We can prevent and control of parasitic diseases by using a routine prophylactic anthelmintic measurement. Further studies on anthelmintics pharmacokinetic and toxicity would be helpful.

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