

Effects of triclabendazole and nitroxynil on EPG, hematological parameters and body weight against fascioliasis in goats at government goat development farm, Sylhet, Bangladesh

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ABSTRACT

The study was conducted to evaluate the effects of triclabendazole and nitroxynil against fascioliasis in goat for a period of 28 days on 20 black bengal goats. Among hundred goats, twenty were selected for this study which was suffering from liver fluke (*Fasciola gigantica*) infection and were marked by tagging. Twenty goats were randomly divided into four groups (A, B, C and D) where each group comprising of five goats. Group A were treated with tablet fasinex (triclabendazole, Novartis Ltd, Bangladesh) orally at the dose rate of 12 mgkg⁻¹body weight, group B were treated with acinex (triclabendazole, ACI Ltd, Bangladesh) orally at the dose rate of 12 mgkg⁻¹body weight and group C were treated with nitronex injection (nitroxynil, Renata Ltd, Bangladesh) subcutaneously at the dose rate of 10 mgkg⁻¹body weight. Goats of group D was kept as infected control group without giving any treatment. A significant (P<0.01) reduction of egg per gram (EPG) count was found on 7th, 14th, 21st and 28th days of treated goats of group A, B and C, respectively. The EPG count of control group were significantly (P<0.01) increased 7 day onwards up to experimental period. Reduction of mean EPG on 7th, 14th, 21st and 28th day after treatment in group A, B and C were 81.48%, 81.25% and 83.04%, respectively, whereas in control group the mean EPG were 22.43%. Of the hematological parameters, TEC, Hb and PCV values were lower on day 0 but turned to increase (p<0.01) on day 28 of the study. On the other hand, ESR and TLC were higher before treatment (day 0) but decreased significantly (p<0.01) on day 28. The body weight increased significantly (P<0.01) after treatments in group A, B and C respectively except untreated control. This result may indicate that three commercial anthelmintics contain triclabendazole and nitroxynil against fascioliasis in goat and nitroxynil have higher efficacies on egg per gram (EPG), hematological parameters and body weight against fascioliasis in goat. Additional detailed studies are required to prevent and control of fascioliasis in goats by using a routine phytochemical anthelmintics measurement.

Key words: Anthelmintics, triclabendazole, nitroxynil, eggs per gram (EPG), hematology, body weight, fascioliasis, goats

INTRODUCTION

Bangladesh is an agro-economy based developing countries of the world. The livestock is an important sub-sector which is considered to be the backbone of agriculture in Bangladesh^[1] and approximately 80% people depend on it directly or indirectly for their subsistence. The livestock population in Bangladesh is currently estimated to comprise 26.828 million cattle, 0.544 million buffalo, 16.242 million goat and 1.221 million sheep^[2] which plays an important role in the rural economy^[3]. Fascioliasis, caused by *Fasciola hepatica* and *F. gigantica*, is one of the most prevalent helminthes infections of ruminants in different parts of the world inducing significant morbidity and mortality^[21] as well as lower production of ruminants^[20]. This group of liver fluke (*Fasciola sp.*) is also associated with anaemia^[28]

resulting loss of body weight, stunted growth, diarrhea etc. that greatly hamper the normal growth and production of goat. The mortality rates are 5% due to fascioliasis infestation in goat in Bangladesh^[5]. The agro-ecological and geo-climatic condition of Bangladesh is highly favorable for the growth and multiplication of parasites. The heavy rainfall in the summer and autumn, deep fog in the winter and also low lying region might be the causes of higher prevalence of the disease in Bangladesh^[18]. Prevalence of fascioliasis is higher during the rainy season in slaughtered goats^[11]. The reason for the more prevalence of *Fasciola sp.* after summer season may be due to conducive factors like presence of marshy places with grass at the canal banks and presence of snails in the area reported by^[31]. Outbreaks of fascioliasis occurred after flooding reported by^[35]. Especially rainfall climate conditions

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were often associated with prevalence of the fasciola infection because this was suitable for intermediate host like snails to reproduce and to survive longer under humid conditions [4]. 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 [34]. The present investigation was aimed to evaluate the effects of three commercial anthelmintics against fascioliasis in goats and their effects on the basis of EPG 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

Experimental period and location

This study was conducted for a period of 28 days at government goat development farm, Sylhet (24.909221°N 91.901986°E) under the supervision of the Department of Physiology and Pharmacology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University (24.909221°N 91.901986°E), Sylhet, Bangladesh to evaluate the effects of triclabendazole and nitroxynil against fascioliasis on EPG, hematological parameters and body weight in goats. The study protocol was approved by the ethical committee of the government goat development farm, Sylhet, Bangladesh.

Experimental goats and their management

Twenty goats of 1.5-2 years old are weighing between 16 to 17 kg were selected randomly which were severely infected with fascioliasis. All the goats were reared under standard farm managemental procedure.

Experimental design

Twenty goats were randomly divided into four groups each comprising of five goat and marked as A, B, C and D. Goats of group A were treated with tablet fasinex (Triclabendazole, Novartis Ltd, Bangladesh) orally at the dose rate of 12 mgkg⁻¹body weight, group B were treated with acinex (triclabendazole, ACI Ltd, Bangladesh) orally at the dose rate of 12 mgkg⁻¹body weight and group C were treated with nitronex injection (nitroxynil, Renata Ltd, Bangladesh) subcutaneously at the dose rate of 10 mgkg⁻¹body weight and goats of group D served as untreated control.

Measurement of EPG and live weight of goat

Weekly EPG count was done on day 7th, 14th, 21st, 28th post treatment by McMaster egg counting technique. McMaster fecal egg count method

described by [8] was used. The percentage of reduction of EPG (eggs per gram) was calculated as $N1-N2/N1 \times 100$; N1= Number at day "0"; N2 = Number on next counting day. The body weight of all goats was taken as described by [29]. Body weight = Length x (Girth)²/300 x 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.

Collection of blood sample

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. All the goat of treated and control groups were closely observed for 28 days after treatment.

Fecal and hematological examination

The fecal samples were collected from the treated and control groups of goat on 7th, 14th, 21st and 28th day of treatment to investigate the fecal egg count and were immediately brought to the Physiology and Pharmacology Laboratory, Sylhet, Bangladesh for fecal examination. 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, 15].

Statistical analysis

All the data were statistically analyzed by the statistical package programmed MSTAT-C developed by [24] and following the standard methods by [27] to find out the level of significance at 1 and 5% level. The mean difference among the treatments was determined as per Duncan's Multiple Range Test [10]. The eggs of parasites were identified on the basis of morphological characteristics as described by [28] and then counted.

RESULTS AND DISCUSSION

Effects of triclabendazole and nitroxylin on egg count EPG (eggs per gram) in goats

The result of the effects of three commercial anthelmintics against fascioliasis in goats is presented in (Table 1). In the treatment group A, mean EPG count before treatment 216.00±10.77 and after treatment mean EPG on 7th, 14th, 21st and 28th day were 68.00±5.26, 60.00±5.24, 52.00±5.83 and 40.00±1.52, respectively. The rates of reduction of mean EPG on 28th day after treatment were 81.48%, respectively.

In treatment group B, the pre-treatment mean EPG count was 208.00±0.63 and the post-treatment mean EPG count values at 7th, 14th, 21st and 28th day were 66.00±4.00, 58.00±1.89, 50.00±2.74 and 39.00±2.15, respectively. The rates of reductions were significantly increased to the extent of mean EPG on 28th day after treatments were 81.25%, respectively.

In treatment group C, the pre-treatment mean EPG

Table 1. Effects of triclabendazole and nitroxylin on egg count EPG (eggs per gram) against fascioliasis in goats

Groups	Treatment	Pre-treatment		Post-treatment			% Reduction at day "28"
		Day 0	Day 7	Day 14	Day 21	Day 28	
G _A	Fasinex®	216.00	68.00	60.00	52.00	40.00	81.48
		± 10.77	± 5.26**	± 5.24**	± 5.83**	± 1.52**	
G _B	Acinex®	208.00	66.00	58.00	50.00	39.00	81.25
		± 6.63	± 4.00**	± 1.89**	± 2.74**	± 2.15**	
G _C	Inj. Nitronex®	224.00	76.00	50.00	76.00	38.00	83.04
		± 10.29	± 2.09**	± 5.68**	± 2.55**	± 0.89**	
G _D	Control group	214.00	230.00	252.00	255.00	262.00	22.43
		± 17.21	± 4.47**	± 7.35**	± 7.24**	± 6.52**	

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

count was 224.00±10.29 and the post-treatment mean EPG count values at 7th, 14th, 21st and 28th day were 76.00±2.09, 50.00±5.68, 76.00±2.55 and 38.00±0.89, respectively. The rates of reductions were significantly increased to the extent of mean EPG on 28th day after treatments were 83.04%, respectively. Mean body weight of untreated control group D (day 0) EPG count was 214.00±17.21 and on the EPG count values at 7th, 14th, 21st and 28th day were 230.00±4.47, 252.00±7.35, 255.00±7.24 and 262.00±6.52, respectively and the rate of EPG count was increased to the extent of mean EPG on 28th day were 22.43%, respectively.

The effects of anthelmintic 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. This findings support the earlier works of [30,26,33,7,22,17] in goat, sheep and cattle. On the other hand, the EPG count of control group were significantly (P<0.01) increased 7 day onwards up to study period. This study supports the previous findings recorded by [13]. More than 98 % efficacy in hill sheep flocks in the west of Ireland reported by [19]. However it could be concluded that, nitroxylin is a potent anthelmintic from the family of substituted phenols that is utilized in ruminants for the control of trematodes, particularly for *Fasciola hepatica* [23].

Effects of triclabendazole and nitroxylin on hematological parameters in goats

The effects of triclabendazole and nitroxylin on hematological parameters against fascioliasis in goats were shown in (Table 2).

Total Erythrocyte Count (TEC): The pre-treatment values of TEC (million/cu. mm of blood) were

7.60±0.34, 7.56±0.19 and 7.78±0.26 in the goat of group A, B and C, respectively. On the 28th day of the post-treatment, the mean values of TEC were increased up to 8.38±0.25, 8.36±0.21 and 8.42±0.17 in the goat of group A, B and C, respectively. The mean value of TEC in control group (group D) was 7.74±0.26 but the mean values of TEC started to decrease on 28th day and recorded as 6.70±0.24. The mean value of TEC was significantly increased (p<0.01) on 28th day of the treatment of three anthelmintics. These results are more or less similar with the earlier researchers of [14,12,30,32] in goat, sheep, calf and cattle. The improved level of TEC content of blood in treated goat might be due to elimination of parasites.

Hemoglobin (Hb) concentration: The pre-treatment values of Hb (g %) were 8.44±0.25, 8.40±0.40 and 8.60±0.48 in the goat 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

of PCV in control group (group D) was 27.95±0.02 but the mean values of PCV started to decrease on 28th day and recorded as 25.10±0.07. The mean value of PCV was significantly increased (p<0.01) on 28th day of three anthelmintics treatment. Similar results

Table 2. Effects of triclabendazole and nitroxynil on hematological parameters against fascioliasis in goats

Groups	Treatment	Pre-treatment					Post-treatment				
		Day 0					Day 28				
		TEC	Hb	PCV	ESR	TLC	TEC	Hb	PCV	ESR	TLC
G _A	Fasinex®	7.60	8.44	28.40	0.98	8.14	8.38	9.72	30.40	0.68	7.60
		±0.34	±0.25	±0.07	±0.004	±0.037	±0.25**	±0.37**	±0.04**	±0.001*	±0.02*
G _B	Acinex®	7.56	8.40	28.34	0.97	8.08	8.36	9.70	29.98	0.62	7.24
		±0.19	±0.40	±0.42	±0.004	±0.024	±0.21**	±0.23**	±0.03**	±0.007*	±0.02*
G _C	Inj. Nitronex®	7.78	8.60	28.98	1.02	8.34	8.42	10.14	30.82	0.76	7.70
		±0.26	±0.48	±0.02	±0.005	±0.02	±0.17**	±0.16**	±0.05**	±0.008*	±0.019*
G _D	Control group	7.74	8.32	27.95	0.92	7.96	6.70	7.40	25.10	1.20	8.58
		±0.26	±0.31	±0.02	±0.008	±0.013	±0.24**	±0.52**	±0.07**	±0.011*	±0.017*

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)

9.72±0.37, 9.70±0.23 and 10.14±0.16 in the goat of group A, B and C, respectively. The mean value of Hb (g %) in control group (group D) was 8.32±0.31 but the mean values of Hb (g %) started to decrease on 28th day and recorded as 7.40±0.52. The mean value of Hb (g %) was significantly increased (p<0.01) on 28th day of three anthelmintics treatment. Similar results have also been stated with the earlier researchers of [9,25] in goat, and camel. The increase in hemoglobin content of blood might be due to the increases of total erythrocytes in blood.

Packed Cell Volume (PCV): The pre-treatment

have also been stated by the earlier workers of [9,25] in goat and camel. The improved level of PCV content of blood in treated goat might be due to elimination of parasites.

Erythrocyte Sedimentation Rate (ESR): The initial control values of ESR (mm h⁻¹) were 0.98±0.007, 0.97±0.004 and 1.02±0.005 in the goat 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 0.68±0.01, 0.62±0.007 and 0.76±0.008 in the goat of group A, B and C,

Table 3. Effects of triclabendazole and nitroxynil on bodyweight against fascioliasis in goats

Groups	Treatment	Pretreatment		Post-treatment		Live weight gain/loss (kg)	Improvement (%)
		Day 0		Day 28			
		Body weight (kg)	Body weight (kg)	% change			
G _A	Fasinex®	16.50±0.068	17.50±0.068**	1.02		+1.02	+2.12
G _B	Acinex®	16.60±0.07	17.00±0.065**	0.40		+0.40	+2.42
G _C	Inj. Nitronex®	16.40±0.07	17.60±0.07**	1.20		+1.20	+2.95
G _D	Control group	16.30±0.13	15.35±0.13**	-0.95		-0.95	-1.80

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

values of PCV were 28.40±0.07, 28.34±0.42 and 28.98±0.02 in the goat of group A, B and C, respectively. On the 28th day of the post-treatment, the mean values of PCV were increased up to 30.40±0.04, 29.98±0.03 and 30.82±0.05 in the goat of group A, B and C, respectively. The mean value

respectively. The mean value of ESR (mm h⁻¹) in control group (group D) was 0.92±0.08 but the mean values of ESR (mm h⁻¹) started to increase on 28th day and recorded as 1.20±0.011. 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 ^[14,30,9] in calf, sheep and camel.

Total Leukocyte Count (TLC): The pre-treatment values of TLC were 8.14 ± 0.037 , 8.08 ± 0.024 and 8.34 ± 0.02 in the goat of group A, B and C, respectively. On the 28th day of the post-treatment, the mean values of TLC were decreased up to 7.60 ± 0.02 , 7.24 ± 0.02 and 7.70 ± 0.019 in the goat of group A, B and C, respectively. The mean value of TLC in control group (group D) was 7.96 ± 0.013 but the mean values of TLC started to increase on 28th day and recorded as 8.58 ± 0.017 . 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 ^[32,25] in goats. During the study of hematological parameters it was found that after treatment with fasinex, acinex and nitronex injection, TEC, Hb and PCV were significantly ($p < 0.01$) increased and on the other hand, ESR and TLC was significantly ($p < 0.05$) decreased in treated groups. The mean value of Hb, PCV and TEC were decreased and ESR, TLC values were increased in untreated control group.

Effects of triclabendazole and nitroxynil on body weight

The mean initial body weight on day '0' of goat in group A, B and C were 16.50 ± 0.068 , 16.60 ± 0.07 and 16.40 ± 0.07 kg respectively was shown in (Table 3). On the 28th day of the post-treatment, the mean values of body weight were increased up to 17.50 ± 0.068 , 17.00 ± 0.065 and 17.60 ± 0.07 in the goat of group A, B and C, respectively. Mean body weight of untreated control group D (day 0) was 16.30 ± 0.13 and on the 28th day were 15.35 ± 0.13 . 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 might have facilitate the weight regain through proper absorption and metabolism of feed nutrient in the parasite free (*Fasciola gigantica*) goat reported by ^[16] in dairy cow. On the other hand, the body weight significantly decreased in untreated control group (D) 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 2.12%, 2.42% and 2.95%, respectively. Some earlier workers found improvement in body weight after treatment ^[9,16] in goat, sheep and cattle. In the control group (group D) body weight was reduces to the extent of 1.08 % after 28th day (Table 3).

CONCLUSION

The finding of the present study reveals that nitronex (nitroxynil) are highly effective on egg count (EPG), hematological parameters (TEC, Hb, PCV, ESR and TLC) and body weight in fascioliasis in goat than that of fasinex (triclabendazole) and acinex (triclabendazole) during the experiment. These three drugs having wide therapeutic index, cost effective

and their market prices are within the reach of the farmers in our country. It was also observed that farms in these areas lack fences and cattle, sheep and goats use the same pasture for grazing. In this regard, it is suggested that practice of separate grazing of animals with low stocking rate may be adopted. It is therefore, suggested that anthelmintic treatment on quarterly basis may be implemented to reduce the risk of re-infection. Further study should be required to prevent the parasitic infection of the animals and maximizing the production.

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