



# Comparative Efficacy of Triclabendazole, Oxyclozanide and Nitroxynil against Bovine Fasciolosis and its Effect on Various Blood Parameters

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## ABSTRACT

A study was conducted in order to determine the comparative efficacy of Triclabendazole, Oxyclozanide and Nitroxynil against *Fasciola* sp. infestated bovines (cattle and buffaloes) and their effect on various blood parameters (WBC, RBC, Hb, HCT and MCHC). For this purpose, 40 infected animals were selected. After dividing them randomly in four groups of 10 animals each, drug was administered to first three groups whereas last one was kept under positive control for comparison. Study revealed that Triclabendazole was most effective drug of all three in both cattle and buffaloes with efficacy of 97.92% and 100%, respectively; Oxyclozanide was 2<sup>nd</sup> most effective with efficacy of 96.87% and 97.05% % whereas Nitroxynil remained at last with efficacy of 93.47% and 92.15% at 21<sup>st</sup> day post-medication. A slight increase of egg counts was observed in positive control groups of both animal categories. Blood parameters of healthy and *Fasciola* infected animals (cattle's and buffaloes) were compared; specifically, Mean±S.E.M value of WBCs (white blood cells) in infected animals had increased compared to healthy animals. At the same time, significant decrease was observed in RBCs (red blood cells), Hb (haemoglobin), and HCT (hematocrit) in *Fasciola* infected animals compared to health animals but no significant difference was observed in MCHC (meancorpuscular hemoglobin concentration) quantity within both animal categories.

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### Authors' Contribution

MI designed the project. AW did experiment and sampling. UI, AT and IK compiled and analyzed the data statistically. MI and AW wrote the manuscript. SSA reviewed the manuscript.

### Key words

Triclabendazole, Oxyclozanide, Nitroxynil, Bovine, Fasciolosis.

## INTRODUCTION

Gastrointestinal parasitism is a world-wide problem for both small-scale and large-scale farmers; and therefore, is a great threat to livestock industry (Saddiqi *et al.*, 2010) parasites, *i.e.*, helminths residing in the GIT tract of animal are provably the major menace to the productivity of animals all across the world, especially in tropics (Githiori *et al.*, 2004). Prevalence of GI helminths have been reported in domestic animals all around the globe which ranges between 0.72 to 84.1% (Fikru *et al.*, 2006; Bundy *et al.*, 1983). In Pakistan, prevalence of GIT helminthiasis has been reported to be ranging from 25.1 to 92% (Khan *et al.*, 2009; Raza *et al.*, 2007). Parasitic infestations especially gastrointestinal nematode and trematode pose serious health threats to domestic animals

(Nwosu *et al.*, 2007; Raza *et al.*, 2010). In cattle, the most common trematodes observed are *Fasciola hepatica* and *Fasciola gigantica* (Rafuallah *et al.*, 2011). *F. hepatica*, a trematode causing fasciolosis is a widely prevalent in cattle throughout the world. There are many evidences that the prevalence of liver fluke (*Fasciola* spp.) is expanding progressively, even in those geographic regions where the parasite was not formally endemic (Pritchard *et al.*, 2005). *F. hepatica* is also observed endemic in buffaloes, cattle, goats, sheep and humans in Pakistan (Qureshi *et al.*, 2005; Iqbal *et al.*, 2007; Ijaz *et al.*, 2009; Khan *et al.*, 2010). This increase is somewhat due to higher autumn and summer rainfall, and this development is likely to persist in future (Fox *et al.*, 2011). Bovine fascioliasis is a systemic infection of cattle caused by the liver flukes, *F. gigantica* and *F. hepatica*. It is an important and well established veterinary disease of both domestic and wild ruminants, causing enormous economic losses in livestock industries through animal mortality, growth retardation, sterility, condemnation of affected livers and expense due

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to control measures (Malone *et al.*, 1998). *F. hepatica* or *F. gigantica* migrates through the liver parenchyma and tissue; when it becomes mature, it feeds on the blood of the final host at a rate of 0.2 to 0.5 ml per day per fluke, which leads to severe anemia (Wiedosari *et al.*, 2006). Bovine fascioliasis results in significant blood loss with all associated consequences (Soun *et al.*, 2006); nevertheless, adverse effects depend on the parasite load (Coop and Kryziakis, 2001; Wiedosari *et al.*, 2006).

## MATERIALS AND METHODOLOGY

The faecal and blood samples were collected from the field and livestock farms.

The faecal samples were analyzed using direct smear method and sedimentation technique, whereas counting of eggs (EPG) was done by Modified McMaster Technique. None of the randomly selected animals received any anthelmintic 6 months before faecal examinations. Triclabendazole (Fasisym) was given orally at a dose rate of 1ml/5kg body weight. Oxyclozanide (Zanil) was given orally at a dose rate of 15 ml/50kg body weight, and Nitroxylnil (Trodax) was given Sub-cutaneous at a dose rate of 1.5 ml/50kg body weight. Positive animals were distributed in four groups; each containing 10 animals (n=5 cattle and n=5 Buffaloes). Three groups were administered with Triclabendazole, Oxyclozanide and Nitroxylnil at recommended dosages and routes, whereas one was untreated which was kept as control. Identification of helminthes ova was done with the aid of taxonomic keys (Iqbal *et al.*, 2007). The drug efficacy (DE) was calculated on the basis of reduction in number of egg per gram of faeces by following formula (Varady *et al.*, 2004):

$$DE = \left[ \frac{(\text{Pre treatment EPG} - \text{Post treatment EPG})}{\text{Pre treatment EPG}} \right] \times 100$$

The blood samples from 24 (n=12 cattle, n=12 buffaloes) naturally infected (*Fasciola* spp.) and 24 (n=

12 cattle, n=12 buffaloes) healthy animals were collected at day zero before medication for comparison of various blood parameters (WBC, RBC, Hb, HCT and MCHC). Blood samples were later analysed using Haematological analyzer.

## RESULTS

### Drug trial

In cattle, when comparison on efficacies was made, Triclabendazole was observed to be the most effective drug of all three with efficacy of 52.08 %, 85.42 % and 97.92% at days 7, 14 and 21, respectively. Oxyclozanide was the second most effective drug in cattle with efficacy of 48.43%, 85.93% and 96.87% at day 7, 14 and 21, respectively. Nitroxylnil was least effective among the three with efficacy of 47.82%, 82.6% and 93.47% at day 7, 14 and 21, respectively. In buffaloes, a similar comparison on efficacies was made. Triclabendazole was observed to be the most effective drug of all three with efficacy of 52.27 %, 88.63 % and 100 % at days 7, 14 and 21, respectively. Oxyclozanide was the second most effective drug with efficacy of 50%, 88.23% and 97.05% at day 7, 14 and 21, respectively. Again, Nitroxylnil remained at the last with efficacy 47.05%, 82.35% and 92.15% at day 7, 14 and 21, respectively. In control group, a slight increase in EPG was observed at day 21<sup>st</sup> compared to day zero in cattle as well as buffaloes.

### Haematology

In cattle the white blood cells (WBC's) observed in healthy cattle group was 7901.67±400.98 cells/mm<sup>3</sup> whereas it increased to 16109.17±688.73 cells/mm<sup>3</sup> in infected cattle group. Mean difference of 8207.5±796.95 cells/mm<sup>3</sup> was noted between infected and non-infected animals group which is a significant increase with p-value = 0.071 < ( $\alpha$  = 0.10). The red blood cells (RBC's) observed in healthy animals group was 7.245±0.760 cells/mm<sup>3</sup> × 10<sup>6</sup>,

**Table I.- Effect of drugs on EPG (mean ±SD) after different days of treatment in cattle and buffaloes.**

Treated groups	EPG on days				DE at days (%)		
	Control	7	14	21	7	14	21
<b>Cattle</b>							
Triclabendazole	480±57.00	230±75.82	70.0±27.38	10.0±22.36	52.08	85.42	97.92
Oxyclozanide	640±108.3	330±57.00	90.0±41.83	20.0±27.38	48.43	85.93	96.87
Nitroxylnil	460±65.19	240±41.83	80.0±27.38	30.0±27.38	47.82	82.60	93.47
<b>Buffaloes</b>							
Triclabendazole	440±171.0	210±114.0	50.0±35.35	0±0.00	52.27	88.63	100
Oxyclozanide	340±41.83	170±67.08	40.0±41.83	10.0±22.36	50.00	88.23	97.05
Nitroxylnil	510±82.15	270±67.08	90.0±41.83	40.0±22.36	47.05	82.35	92.15

EPG, egg per gram of faeces; DE, drug efficacy.

whereas it decreased to  $4.06 \pm 0.402$  cells/mm<sup>3</sup> × 10<sup>6</sup> in infected animals group. Mean difference of  $3.185 \pm 0.248$  cells/mm<sup>3</sup> × 10<sup>6</sup> was noted between infected and healthy animal group which is a significant decrease with p-value =  $0.011 < (\alpha = 0.10)$ . The haemoglobin (Hb) content observed in healthy animals group was  $11.32 \pm 0.41$  g/dl whereas it decreased to  $6.83 \pm 0.13$  g/dl in infected animals group. Mean difference  $4.50 \pm 0.43$  g/dl was noted between infected and healthy animal group which is a significant decrease with p-value =  $0.004 < (\alpha = 0.10)$ . The hematocrit (HCT) observed in healthy animals group was  $33.98 \pm 1.06$  % whereas it decreased to  $21.96 \pm 0.37$  % in infected animals group. Mean difference  $12.02 \pm 1.12$  % was noted between infected and healthy animal group which is a significant decrease with p-value =  $0.000 < (\alpha = 0.10)$ . The mean corpuscular hemoglobin concentration (MCHC) observed in healthy animals group was  $31.52 \pm 0.28$  %, whereas it was  $31.0 \pm 0.22$  % in infected animals group. Mean difference of  $0.52 \pm 0.35$  % was noted between infected and healthy animal group which has no significance with p-value =  $0.533 > (\alpha = 0.10)$ .

**Table II.- Comparison of hemetologic parameters (Mean ± SEM) in infected and healthy cattle and buffalo groups.**

Para- meters	Cattle		Buffalo	
	Infected	Healthy	Infected	Healthy
WBC (cells/mm <sup>3</sup> )	16109.17± 688.73	7901.67± 400.98	15932± 733.53*	8017.5± 375.34
RBC (cells/ mm <sup>3</sup> × 10 <sup>6</sup> )	4.06± 0.12	7.24± 0.22	4.15± 0.11*	7.35± 0.21
Hb (g/dl)	6.82±0.13	11.32±0.41	6.90±0.14*	11.40±0.47
HCT (%)	21.96±0.37	33.98±1.06	22.21±0.38*	34.19±0.96
MCHC (%)	31.00±0.22	31.52±0.27	31.02±0.22*	31.54±0.25

In buffaloes the WBC's observed in healthy buffalo was  $8017.5 \pm 378.34$  cells/mm<sup>3</sup> whereas it increased to  $15932 \pm 733.52$  cells/mm<sup>3</sup> in infected animals group. Mean difference of  $7914.17 \pm 823.98$  cells/mm<sup>3</sup> was noted between infected and healthy animal group which is a significant increase with p-value =  $0.007 < (\alpha = 0.10)$ . The RBC's observed in healthy animals group was  $7.347 \pm 0.213$  cells/mm<sup>3</sup> × 10<sup>6</sup> whereas it decreased to  $4.153 \pm 0.115$  cells/mm<sup>3</sup> × 10<sup>6</sup> in infected animal groups. Mean difference of  $3.194 \pm 0.242$  cells/mm<sup>3</sup> × 10<sup>6</sup> was noted between healthy and infected animal group which is a significant decrease with p-value =  $0.010 < (\alpha = 0.10)$ . The Hb observed in healthy animals group was  $11.40 \pm 0.467$  g/dl whereas it decreased to  $6.90 \pm 0.141$  g/dl in infected animals group. Mean difference of  $4.50 \pm 0.487$  g/dl was noted between infected and healthy animal group which is a significant

decrease with p-value =  $0.001 < (\alpha = 0.10)$ . The HCT observed in healthy animals group was  $34.196 \pm 0.963$  % whereas it decreased to  $22.209 \pm 0.383$  % in infected animals group. A mean difference of  $11.987 \pm 1.036$  % between infected and non-infected animal group was calculated which is a significant decrease with p-value =  $0.007 < (\alpha = 0.10)$ . The MCHC observed in healthy animals group was  $31.542 \pm 0.253$  % whereas it was  $31.017 \pm 0.220$  % in infected animal groups. Mean difference of  $0.525 \pm 0.336$  % was noted between infected and non-infected animal group which has no significance with p-value =  $0.836 > (\alpha = 0.10)$ .

## DISCUSSION

The anthelmintic efficacy result of triclabendazole was in accordance with [Gurlap et al. \(1984\)](#) who described efficacy of triclabendazole in sheep (*Fasciola* sp.) more than 99%. Our results are also supported by [Rapic et al. \(1988\)](#), who described efficacy of 100 percent for triclabendazole against *F. hepatica* in cattle. [Richards et al. \(1990\)](#) recorded mean efficacies of triclabendazole to be 88.1, 95.3 and 90.7 % against one-, two- and four-week-old early immature flukes, respectively. [Sanabria et al. \(2013\)](#) and [Wolf et al. \(1983\)](#) also recorded 100% efficacy of triclabendazole against naturally *F. hepatica* infected sheep. [Keyyu et al. \(2006\)](#) described triclabendazole efficacy of 100 % against *F. gigantica* in cattle. The results on anthelmintic efficacy of oxyclozanide were in accordance with [Shokier et al. \(2013\)](#), who recorded the efficacy of oxyclozanide to be 100 % against *Fasciola* sp. [Paraud et al. \(2009\)](#) recorded that oxyclozanide reduced the worm burdens to 95.9%. Later, 96% efficacy of oxyclozanide as flukicide was also recorded by [Athar et al. \(2011\)](#). [Mooney et al. \(2009\)](#) also reported more than 98% efficacy for oxyclozanide in sheep against *F. hepatica*. The results obtained for nitroxynil were in accordance with [Durrani et al. \(2007\)](#), who determined percentage efficacy for nitroxynil as 93.88% against fasciolosis with no side effects after medication. [Rapic et al. \(1988\)](#) determined 95.0 percent efficacy of nitroxynil in cattle against fasciolosis. [Dobbins et al. \(1982\)](#) described efficacy of nitroxynil to be 88.5 % in cattle against *Fasciola* sp. Almost similar results for WBC's were also reported by [Egbu et al. \(2013\)](#), who observed notable increase in WBC's of infested animals compared to the healthy animals with increase in worm load. [Doaa et al. \(2007\)](#) also observed significant increases in the total count of WBC's of infected animals compared to the healthy animals. [Martinez-Valladares et al. \(2010\)](#) also reported higher white blood cells counts in infected animals than the reference range. A similar set of results were also reported by [Egbu et al. \(2013\)](#) for RBC's and

Hb who observed notable reduction in RBC's and Hb of infected animals compared to the reference count. [Leka \*et al.\* \(2005\)](#) and [Doaa \*et al.\* \(2007\)](#) also observed significant decrease in the counts of RBC's and Hb of infected animals compared to the reference count. Last but not the least, an identical set of results for PCV/HCT was also reported by [Egbu \*et al.\* \(2013\)](#) and [Doaa \*et al.\* \(2007\)](#), who observed notable reduction in PCV of infected animals compared to the healthy animals. Almost similar results for MCHC were also reported by [Egbu \*et al.\* \(2013\)](#), who observed "no" notable difference between MCHC of infected and normal animal.

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#### Statement of conflict of interest

The authors declare no conflict of interest.

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