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Efficacy of anthelmintics against GI Helminths of Cattle in Pulwama district of South Kashmir

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Abstract

The present study was undertaken to evaluate the therapeutic efficacy of different anthelmintics viz, ivermectin, fenbendazole, closantel and oxcyclozanide under field conditions against gastrointestinal (GI) helminths of cattle in Pulwama district of south Kashmir. A total of 90 cattle (EPG \geq 100) infected with GI helminths were selected and divided into six groups of 15 animals each. The animals in group 1 were treated with fenbendazole, group 2 with closantel, group 3 with ivermectin and animals of group 4 were kept as infected untreated control for nematode infections. The animals of group 5 were treated with oxcyclozanide and the animals of group 6 were kept as infected untreated control for trematode infections. For determining the efficacy of fenbendazole, closantel & ivermectin, the faecal samples collected on '0' day before treatment and on 7th & 14th day post treatment were examined quantitatively by Modified Mc Master's technique. For determining the efficacy of oxcyclozanide drug in addition to 7th and 14th day post treatment collection, one more collection was done on 28th day. On the basis of Faecal Egg Count Reduction Test (FECRT), ivermectin, closantel and fenbendazole were found to be 100 per cent effective against strongyle worms on 7th and 14th day post treatment. Similarly oxcyclozanide was found to be 100 per cent effective against paramphistomes on 7th, 14th and 28th day post treatment.

Keywords: efficacy, fenbendazole, closantel, ivermectin, oxcyclozanide, cattle, GI helminths, Kashmir

1. Introduction

Parasitic infections inflict heavy losses to livestock industry through mortality, morbidity, reduced feed conversion ratio, inefficiency of production and by way of costs incurred on treatment and control (Shahardar, 2013) [28]. Shan and Chaudhry (1995) [27] reported that the economic losses due to helminth diseases in cattle in India run millions of rupees and these GI helminths in India are alone responsible for five per cent mortality (Chakraborty & Lodhi 1994) [8]. Control of these helminths is usually undertaken by using anthelmintics both for prophylactic and curative purposes. The indiscriminate and widespread use of these anthelmintics has led to development of resistance by helminth parasites especially of small ruminants (van Wyk, 2001, Mortensen *et al.* 2003) [30, 21] and equines (Kumar *et al.* 2016) [19] across the globe. India is slowly emerging as the resistance epicentre of south Asia (Sanyal, 1998) [25]. Resistance to anthelmintics agents in small ruminants has been reported among various species of GI parasites in all parts of world including India (Gill, 1996, Sutherland *et al.* 2011, Jaiswal *et al.* 2013, Chandra *et al.* 2015) [15, 29, 17, 9]. In the absence of adaptation of other alternative control measures to control helminth parasites of livestock, it is very necessary to conserve the efficacy of currently available anti-parasitic drugs. With the result it becomes imperative to check the efficacy of commonly used anthelmintics from time to time so that a proper rotational strategy is devised to delay the development of anthelmintic resistance. For evaluation of anthelmintic efficacy, different *in vivo* and *in vitro* tests are recommended (Coles *et al.* 1992) [10] and the Faecal Egg Count Reduction Test (FECRT) is the most common method used for detection of anthelmintic efficacy (Presidente, 1985) [22]. In Kashmir valley, benzimidazole resistance against GI nematodes of small ruminants has been reported by Bihqi (2013) [5] and Allaie (2018) [3] but there is no report on anthelmintic resistance in GI parasites of cattle in central (Bushra, 2010) [7] and north zone (Aiman, 2014) [2], where tests for evaluation of anthelmintic efficacy has been conducted. Since no such study has been conducted among cattle of south Kashmir, therefore, the present study was undertaken to evaluate the efficacy of commonly used anthelmintics against GI helminths of cattle in Pulwama district of south Kashmir which is the main milk producing area in the valley with sizeable cattle population.

2. Materials and Methods

The study was conducted on locally reared cattle in south Kashmir. Pulwama district is one of the ten districts of Kashmir province. This district lies in the southern part of Kashmir valley and is located between 33°30' and 34°05' North latitude and between 74°05' and 75°01' East longitude. Pulwama district is hilly and mountainous towards the northeast and southwest with broad intermountain valley. The altitude of the hill ranges up to 3700 m above sea level. The climate of the district is temperate cum mediterranean type.

The therapeutic efficacy of anthelmintic drugs *viz.* ivermectin, fenbendazole, closantel and oxclozanide was determined using the Faecal Egg Count Reduction Test (FECRT) as per the guidelines of World Association for Advancement of Veterinary Parasitology (WAAVP) (Coles *et al.* 2006) [11]. A total of 90 cattle (EPG ≥ 100) infected with GI helminths were selected and divided into six groups of 15 animals each. Group 1 animals were treated with fenbendazole, group 2 with closantel, group 3 with ivermectin and the animals of group 4 were kept as infected untreated control for nematode infections. Group 5 animals were treated with oxclozanide and the animals of group 6 were kept as infected untreated control for trematode infections (Table 3.1). For determining the efficacy of fenbendazole, closantel & ivermectin, the faecal samples collected on '0' day before treatment and on 7th & 14th day post treatment were examined quantitatively by Modified Mc Master's technique for determination of egg per gram of faeces. For determining the efficacy of oxclozanide drug, in addition to 7th and 14th day post treatment collections, one more collection was done on 28th day. The efficacy of different anthelmintic drugs was calculated by comparing mean EPG on "0" day i.e. before treatment and after treatment on 7th and 14th day (for nematode positive animals) and on 7th, 14th and 28th day (for trematode positive animals) using below mentioned formula as described by Coles *et al.* (1992) [10] i.e. $FECR\% = (1 - XT/XC) \times 100$ (X = Arithmetic mean of EPG (post treatment); t = treated group; c = control group) and the results were interpreted by appropriate statistical method. The complete schedule of treatment for drug trial, dosage and route of administration is presented in Table 3.1.

3. Results and Discussion

In the present study, percent reduction in egg counts with fenbendazole, closantel and ivermectin against nematodes (strongyle worms) and with oxclozanide against trematode infection (Paramphistomes) was recorded as 100.00 per cent (Table 3.1). As per Coles *et al.* (1992) [10] these values suggest that all the above four drugs are effective against the respective parasitic infections of cattle in district Pulwama of south zone of Kashmir Valley as the criteria for efficacy i.e. FECR% is more than 95.00 per cent and there is no evidence of development of resistance against these helminth parasites. Fenbendazole was found to be 100 per cent effective against strongyle worms on 7th and 14th day post treatment (Table 3.1). Our results regarding the efficacy of fenbendazole against strongyle worms are in agreement with those reported by Bushra (2010) [5] and Aiman (2014) [2] in central and north zone of Kashmir valley, who reported 100 per cent efficacy of fenbendazole against gastrointestinal nematode infection in cattle. Similarly, Sahoo *et al.* (2003) [24] observed EPG count

reduced to zero by 6th day in cows in Bhubaneswar infected with GI nematodes after treatment with fenbendazole. Studies of Rajkhowa *et al.* (2003) [23] in mithuns of Nagaland with albendazole showed 100 per cent reduction in the number of ova on 7th, 9th and 12th day after treatment. Also Demeler *et al.* (2009) [13] observed 100% efficacy against GI nematodes of cattle in Germany, Belgium and Sweden farms by FECRT using benzimidazole group of anthelmintics. However, Islam *et al.* (2015) [16] observed efficacy of fenbendazole against GI nematodes in cattle of Bangladesh on 7th, 14th, 21st and 28th day as 46.67, 71.67, 83.33 and 90.56% respectively.

Closantel was also found to be 100 per cent effective against strongyle worms on 7th and 14th day post treatment (Table 3.1). Our observation is almost similar to Garedaghi *et al.* (2011) [14] who reported the efficacy of closantel against *Haemonchus* spp. and *Bunostomum phlebotomum* to be 97%, however, Bushra (2010) [5] reported efficacy of closantel as 94.44 per cent against strongyle worms in central zone of Kashmir valley. Our results are in agreement with Borgsteede *et al.* (2008) [6] who observed 100% efficacy of closantel against *Ostertagia ostertagi*, *Cooperia punctata*, *Trichuris* spp. and larval intestinal nematodes in cattle at Netherlands while as only 92% and 99.4% efficacy was reported against *C. oncophora* in experimentally induced infection & naturally infected animals respectively. Costa *et al.* (1996) [12] found closantel highly effective (>90%) against adult *Haemonchus contortus*, 75-90 per cent effective against adult and immature *Bunostomum phlebotomum* and only 50-75 per cent effective against *Trichuris discolor*, *Capillaria bovis* and immature *Cooperia punctata*. It was ineffective against immature *H. contortus* and adult *H. similis*, *Trichostrongylus axei*, *Oesophagostomum radiatum* and *Cooperia punctata*.

Ivermectin was found to be 100 per cent effective against strongyle worms on 7th and 14th day post treatment (Table 3.1). Our observation is in agreement with Kumar *et al.* (2004) [18] who also found ivermectin to be 100 per cent effective in controlling natural gastrointestinal nematodosis in cattle after 7 days post treatment in Ranchi. Sarkar *et al.* (2005) [26] also reported efficacy of ivermectin against GI nematodes in calves to be 100, 100 and 95.8 per cent on 7th, 21st and 30th day, respectively, in Bangladesh. This drug was also found 100 per cent effective against strongyle worms in cattle in central and north zone of Kashmir valley by Bushra (2010) [5] and Aiman (2014) [2], respectively. Similarly, Ahmed *et al.* (2007) [1] observed 100 per cent efficacy of ivermectin on 14th day post treatment against gastrointestinal nematodes in naturally infected cattle of Assam.

In the present study, oxclozanide was found to be 100 per cent effective against paramphistomes on 7th, 14th and 28th day post treatment (Table 3.1). Our findings are in close proximity with the study of Arias *et al.* (2013) [4] who observed faecal egg count reduction value of 97-99 per cent against paramphistomes in dairy cattle of Spain. Aiman (2014) [2] also found 100 per cent reduction in faecal egg count on 8th, 14th and 28th day post-treatment with oxclozanide against paramphistomes in cattle of northern Kashmir. Similarly oxclozanide was found to be 100% effective on day 28th post-treatment against paramphistomosis in buffaloes (*Bubalus bubalis*) by Kumar *et al.* (2006) [8] in and around Ludhiana.

Table 3.1: Efficacy of commonly used anthelmintics against GI helminths of cattle based on FECRT in south Kashmir

Group	Anthelmintic used	Dose & route of administration	Mean EPG (Day 0)	Mean EPG (Day 7)	FECR (%)	Efficacy (%)	Mean EPG (Day 14)	FECR (%)	Efficacy (%)	Mean EPG (Day 28)	FECR (%)	Efficacy (%)
1	Fenbendazole	7.5mg/kg bd.wt/oral	141.67±9.66	0.00±0.00	100	100.00	0.00±0.00	100	100.00	-	-	-
2	Closantel	7.5mg/kg bd.wt/oral	150.00±6.91	0.00±0.00	100	100.00	0.00±0.00	100	100.00	-	-	-
3	Ivermectin	0.2mg/kg bd.wt/oral	153.33±8.75	0.00±0.00	100	100.00	0.00±0.00	100	100.00	-	-	-
4	Control (for nematodes)	-	123.33±8.61	148.33±8.26	-	-	170.00±6.98	-	-	-	-	-
5	Oxyclozanide	10mg/kg bd.wt/oral	153.33±13.33	0.00±0.00	100	100.00	0.00±0.00	100	100.00	0.00±0.00	100	100.00
6	Control (for trematodes)	-	133.33±12.60	166.67±12.6	-	-	180.00±10.69	-	-	206.67±6.67	-	-

On the basis of the present study, it may be concluded that all the four drugs *i.e.* Ivermectin, Closantel, Fenbendazole and Oxyclozanide are having efficacy of above 95%, and there is no indication of development of resistance by helminth parasites of cattle which indicates that they may still be used scientifically in worm control programmes against helminth parasites of cattle in south zone of Kashmir Valley.

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