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Therapeutic Efficacy of Albendazole and Tetraclozan Against Gastrointestinal Worms in Crossbred Cows of HARC, Welmera District, Central Ethiopia

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Abstract: Gastrointestinal parasites are economically important in the dairy industry**.** A study was carried out to evaluate the therapeutic efficacy of anthelmintic drugs (Tetraclozan 3400 mg and Albendazole 2500mg) for the treatment of GIT worms in cross-bred cows at Holeta research center. A total of sixty crossbred cows were purposively screened and divided into three groups for the current study. The first groups served as untreated control, the second and third groups were treated with Albendazole and Tetraclozan drugs respectively. Moreover, fecal samples were collected before and after treatment to count the eggs per gram (EPG) of feces and to evaluate drug efficacy percentage. Efficacy for each anthelmintic was determined by the Fecal Egg Count Reduction Test (FECRT). The mean EPG count before and after treatment with Tetraclozan drug on 0. 14^{th} and 21^{st} days was 520±102.1, 100±54.6 and 15±6.7 respectively whereas the mean EPG count on 0, 14^{th} and 21^{st} days before and after treatment with Albendazole drug was 450±127.2, 150±46.2 and 20±6.8 respectively. The overall percentage efficacy of Tetraclozan and Albendazole drugs were 97.11 and 95.5 percent respectively. The study indicated that the two anthelmintic drugs were efficacious against worm infection and thus, leads to reduction in EPG count. It is important to explore the detailed pharmacokinetic and toxic effects of these drugs for wide therapeutic uses in animals. It is also recommended that the clinical responses of GIT helminthes to prophylactic and therapeutic drugs need to be periodically monitored in the farms and further introduced to smallholder farmers.

Keywords: Anthelmintic, Albendazole, EPG, Therapeutic, Efficacy, Treatment, Tetraclozan

1. Introduction

Gastro-intestinal helmenthiosis are economically important to the livestock industry and the dominant parasites are Trichostrongylus, Haemonchus, and Fasciola species [26]. These parasites cause production losses, Lowering weight gains, and mortality in in heavily parasitized animals if left untreated [15]. Subclinical gastrointestinal nematodes are particularly responsible for affecting the health and productive performances of Animals [9]. In young stock, gastrointestinal parasitism is responsible to reduce growth rate by 30%, even with low level of parasite burden, it causes huge economic losses to the poor livestock keeping farmers. Notwithstanding the tremendous actions and efforts made to control Gastrointestinal (GIT) Parasitosis, farmers in Ethiopia continue to incur significant losses due to scarcity of information on the epidemiology and drugs used to treat worm infection. The control of this parasitic helminthes rely largely on the use of anthelmintic drugs [11]. In Ethiopia, nematode infection is mainly controlled by the use of anthelmintic drugs [19]. The anti-parasitic pharmaceutical industries have made tremendous advancements in terms of developing new molecules with improved anthelminthic properties, but parasitism still prevails [17]. The treatment of

gastrointestinal helminthosis mainly involves commercially available anthelmintics such as the benzimidazole, imidazothiazole and microcyclic lactone groups. The extensive use of these drugs for the control of helminthes infections on grazing and indoor feeding livestock has resulted in the development of resistance that is a major practical problem in many countries of Africa [27], Asia [4], South America [16] and Australia [14]. Anthelmintic resistance in gastrointestinal nematodes of ruminants have been increasingly reported worldwide [20] and is severely threatening the potential utilization of this control options [12]. A similar work has also been reported in eastern Ethiopia by [23] where nematodes have shown resistance to albendazole, tetramisole and ivermectin at prescribed dosages in small ruminants. Blood feeding GIT parasites such as, H. contortus, is characterized by the existence of multiple-resistance to repeated applications of benzimidazoles, levamisole and ivermectin [27] However, drug efficacy can be negatively affected factors such as under dosing, exclusive use of drugs of the same mode of action, the use of substandard quality drugs and incorrect use of the drugs. Besides this, methods that can preserve and prolong drug efficacy and prevent the emergence of resistance is very low all over the country [13]. Despite the widespread use of Albendazole and Tetraclozan dugs against gastrointestinal parasites of crossbred dairy cows at on station condition, there is scarcity of information and new knowledge on the current efficacy of these drugs. Longitudinal follow-up study on the effect of deworming on the dynamics of gastro-intestinal parasites of cattle also is lacking. Therefore, the objective of this study was to evaluate therapeutic efficacy of Albendazole and Tetraclozan drugs against Gastrointestinal worms in naturally infected crossbred cows of Holeta research center, Central Ethiopia.

2. Materials and Methods

Anthelmintic therapeutic efficacy study Area

Therapeutic drug efficacy study was performed at Holeta research center. The center is located at 34Km west of Addis Ababa at an elevation of 2400 masl in the central areas of Ethiopia. The area is characterized by mild subtropical weather, with average minimum and maximum temperature of 6.3 and 22.1°C, respectively. The animals were under intensive and semi intensive management systems. The area experience bimodal rainfall pattern with a long rainy season extends from June to September while short rainy season extends from March to April.

2.1. Therapeutic Efficacy Study Crossbred Cows

Study animals were crossbred dry, lactating cows and heifers that were reared and multiplied in the research center. These animals were inclusively used in the experiment based on their weight, body condition and age categories. Animals were frequently monitored for any health and physiological deviations during the course of this experimental study.

2.2. Study Designs and Sample Size

An experimental and prospective study design was undertaken to therapeutically evaluate the efficacy of Albendazole and Tetraclozan dugs against gastrointestinal helminthes in crossbred dairy cows. The efficacy was evaluated on sixty crossbred cows that were naturally infected with GIT helminthes.

2.3. Sampling Techniques and Set up of Anthelmintic Treatment

Purposive sampling method was used to include experimental crossbred cows into the current study. All crossbred cows were randomly divided into three groups and allotted to two drugs having one control groups. Nematodes, Trematodes and mixed parasites were examined and identified by using flotation and sedimentation methods. Eggs per gram (EPG) was evaluated by using Macmaster technique [24] on day 0 (Pretreatment) and 14^{th} and 21^{st} post-treatment days. Crossbred cows in the first groups were treated with oral administration of Tetraclozan 3400 mg body weight and group two were treated with Albendazole at dose of 7.5 mg/kg body weight orally and group three crossbred cows remained untreated and served as control groups. Untreated groups were allowed only for monitoring of natural changes in fecal egg counts until the end of the experiment.

2.4. Pre-post Dosing Fecal Collection and Examination

Fecal samples were collected from the rectum of each crossbred cows before dosing (on day zero) and on days 14 and 21 post treatment to just identify the types of parasites, determine the burden and for the FECRT study. McMaster counting technique was carried out for fecal samples in order to determine the number of eggs per gram of feces (EPG) [25]. Briefly, 3 gram of fecal sample was mixed in 42 ml of saturated salt solution with a sensitivity of 50 EPG of feces and all the aseptic procedures were followed to avoid contamination [6]. The level of worm infection was explored from the severity index defined by [21] where animals harbored low, moderate and massive nematode infection if their fecal egg counts are less than 100 to 250, > 250 to 500 and more than 500 respectively. These procedures were conducted according to [26].

2.5. Fecal Egg Count and Therapeutic Efficacy Evaluation of Drugs

Fecal egg count (FEC) was performed using the modified McMaster technique. Treatment groups expressed as egg per gram of feces (EPGt) was calculated and compared to that of the control group (EPGc). Percentage Reduction (R) was determined by R=(EPGc-EPGt/EPGc) [6, 2]. In each groups of crossbred cows, mean of number of eggs per gram and healing percentage were evaluated by repeated measurement. Comparative efficacy of these drugs was evaluated based on reduction or absence of eggs per gram of feces and

disappearance of clinical signs. Efficacy of drugs were evaluated on the basis of reduction in EPG on post treatment days. The percentage reduction of mean egg excretion on 14 and 21 days post-treatment was determined and means of pre and post treatment fecal egg counts of control and treated crossbred cows were used to determine the percentage efficacy of drugs by using fecal egg count reduction test. Drugs were considered effective if FECR percent was more than 95% and the lower limit of the 95% confidence was more than 90%, while resistance was detected if FECRT was less than 95% and when the lower 95% confidence interval was less than 90% [5].

$$\text{FECR\%} = \frac{\text{EPG before treatment} - \text{EPG after treatment}}{\text{Pretreatment EPG}} \times 100$$

2.6. Data Analysis

Data generated from laboratory works were recorded and coded using Microsoft Excel spreadsheet and analyzed using STATA version 13 for Windows. Pre and post treatment fecal examination results were tabulated. Means of pre-treatment and post treatment fecal egg count of control and treated crossbred cows were used to calculate the percentage efficacy of drugs by using fecal egg count reduction test.

3. Result and Discussions

The identified helminthes in crossbred cows pre-dosing were strongyles, Oesophagostomum, cooperia, Ostertagia and Fasciola species. The FECRT detects clinical cure rather than the total elimination of the GIT parasites in animals [5]. In this respect, the finding of Ostertagia and cooperia species after treatment with the anthelmintic drugs indicated that some of these parasites have escaped or resisted the treatment and the animal can continuously shed eggs of these worms. This could potentially result in selective perpetuation of resistant parasite consequently posing risk of drug resistance [22]. In the current investigation, a decrease in fecal eggs count was found higher in untreated groups than cases treated with abendazole and tetraclozan groups. The high efficacy of abendazole against immature flukes might indicated successful treatment of acute fascioliasis. Similar results have been achieved with the same drug in treatment of acute fascioliasis in sheep, cattle, goats and other experimental animals with 90-100% efficiency [3]. This variation might be due to the difference in the quality of the drugs and seasonal variations in the study areas.

Table 1. *Helmenthis identified after treatments of crossbred cows with therapuetic drugs.*

GIT parasites identified	Treatment groups		
	control	Albendazole (2500mg)	Tetraclozan (3400mg)
Oesophagostomum species	+++	-	-
Ostertagia species	+++	+	+
Fasciola species	+++	-	-
Buonstomum species	+++	+	-
Cooperia species	+++	-	+
Strongyles	+++	-	-

Hint: +++- heavy, +- light, (-)- Non-existence

3.1. Mean EPG Counts

Examination of feces in group one crossbred cows treated with Tetraclozan revealed an average EPG count reduction. Mean EPG count before treatment and after treatment with Tetraclozan on 0. 14th and 21st were 520±102.1, 100±54.6 and 15±6.7 respectively. This is finding is similar to [18] who reported the drug has good potency to inhibit worm eggs. There was substantial improvement of the clinical health of cows in the treatment groups, which were evident with the disappearance of diarrhea, regained appetite and improvement of body weight. In group two albendazole treated crossbred cows, the average EPG counts were also reduced onward days. Reduction of mean EPG on 14th and 21st days after treatment with Albendazole were 150±46.2 and 20±6.8 respectively. In group three untreated crossbred cows, the presence of eggs were confirmed in the fecal samples and their EPG count was considered high.

3.2. Efficacy of Drugs

In Group one treated with Tetraclozan, the efficacy on post-treatment days 14th and 21st were 80.76, and 97.1 percent respectively. The finding was corroborated with the result of [1, 10] who reported the highest recovery rate is due to faster elimination of adult worms from gastrointestinal tract and higher activity of drugs against larval stages. This is related with poor development of drug resistance as a result of drug potency. In Group two treated with Albendazole, the efficacy on post-treatment days 14th and 21st were 66.7 and 95.55 percent respectively. This findings of albendazole efficacy is similar with the studies done by [7] in Germany on monitoring the efficacy of ivermectin and albendazole against gastro intestinal nematodes of cattle. There are anthelmintic resistance in gastrointestinal nematodes of cattle according to the study done by [8] in US on the identification of cattle nematode parasites resistant to multiple classes of anthelmintics in a commercial cattle herd. In general the result showed that the mean FECR value of Albendazole and tetraclozan were 95.6 and 97.1 percent respectively. Both drugs had good efficacy in gastrointestinal nematodes in Holeta dairy research farm from the clinical cure point of view. In general, the efficacy of Tetraclozan drug was higher than that of Albendazole drug in the treatment of GIT worms in crossbred animals. As per World Association for the

Advancement of Veterinary Parasitology guidelines [5]. Resistance is considered if the percentage reduction in egg counts is less than 95 percent and /or the lower 95 percent confidence level is less than 90 percent. If only one of these criteria is met, resistance is suspected and detected.

Table 2. *Pre and post drug treartment of mean fecal egg count of worms in crossbred cows.*

Anthelmintic drugs	Mean FEC±*SEM*			EPG
	Day 0	Day 14	Day 21	
Tetraclozan 3400 mg pos	520±102.1	100±54.6	15±6.7	97.1
Albendazole 2500 mg Pos	450±127.2	150±46.2	20±6.8	95.6

Table 3. *Post tretment efficacy of anthelmitic drugs in crossbred cows.*

Groups	Anthelmintic drugs	EPG pretreatment	EPG post treatment		Overall efficacy
		0-day	14^{th} day	21^{st} day	
G I	Tetraclozan 3400 Mg	1040	200 (80.76)	30 (97.11)	97.11%
GII	Albendazole 2500 Mg	900	300 (66.7)	40 (95.55)	95.55%
GIII	Control	1033	+++	+++	

4. Conclusion and Recommendations

In conclusion, the present study showed that helminthes parasites are prevalent in the farm and albendazole and tetraclozan had good potency for treating helminthosis in crossbred cows. Despite the clinical cure of helmenthiosis, some parasites escaped drug treatments. It is important to explore the detailed pharmacokinetic and toxic effects of these drugs for wide therapeutic uses in animals and clinical responses of GIT helminthes to prophylactic and therapeutic treatments need to be periodically monitored in the farm.

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