Efficacy of selected anthelmintics against gastrointestinal nematodes of sheep owned by smallholder farmers in Wolaita, Southern Ethiopia

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Abstract

The present study was conducted to investigate the efficacy of albendazole, tetramisole and ivermectin against gastrointestinal nematodes of sheep owned by smallholder farmers. Eighty three sheep were selected for the study and divided into four groups: the first group was treated with Albendazole, the second group treated with Tetramisole, the third group with Ivermectin and the fourth group untreated to serve as control. Faecal sample were collected on day zero before treatment, and again on day 10 post treatment. The efficacy for each anthelmintic was measured using the faecal egg count reduction test. The arithmetic faecal egg count reduction for albendazole, tetramisole and ivermectin were 99.34%, 97.77%, and 98.30% respectively. Therefore, the current finding suggests that there is a good state of efficacy for all tested anthelmintics against gastrointestinal nematodes of sheep.

Keywords: Anthelmintic, Faecal egg count, Nematodes, efficacy

Introduction

The major gastrointestinal nematode species reported in the Southern Region of Ethiopia include: Haemonchus contortus, Oesophagus columbianum, Bunostomum trigonocephalum, Trichostrongylus axei, Trichostrongylus colubriformis, Trichuris ovis and Teladorsagia species (Amenu Asha and Abebe Wossene, 2007). These parasites are the causes of decreased productivity particularly under grazing conditions (Tembely et al., 1997). To alleviate this problem the chemotherapeutic use of anthelmintics will remain the mainstay of nematode control program (Taylor et al., 2002). But one of the major problems related to the use of chemotherapy is the development of resistance to anthelmintic drugs (Waller, 1997). Anthelmintic resistance is defined as a decrease in the efficacy of anthelmintics against a population of parasites that were originally susceptible (Sangster and Gill, 1999). This decrease in susceptibility is caused by an increase in the frequencies of resistance gene alleles that result by selection through repeated use of anthelmintic drugs (Fleming et al., 2006; Silvestre and Humbert, 2002; Jackson and Coop, 2000). Frequent use of anthelmintics to control helminthes poses the risk of resistance populations' development (Taylor et al., 2002; Eddi et al., 1996 and Waller et al., 1995). Resistance in the field is usually suspected when there is an apparent poor clinical response to treatment with anthelmintic (Kelly and Hall, 1997).

The development of anthelmintic resistance was first reported for phenothiazine, then to the albendazole and followed by levamisole (Donald, 1983). Resistance to the major classes of anthelmintics has been recorded in Europe (Coles et al., 1994), Australia (Waller et al., 1995), Asia (Gills 1993 and Dorny et al., 1994), North America (Uhlinger et al., 1992), Latin America (Eddi et al., 1996; Echevarria et al., 1996; Maciei et al., 1996 and Nari et al., 1996). In Ethiopia Kassahun Asmare et al. (2005) observed the susceptibility of nematode to albendazole, tetramisole and ivermectin in eastern and southern Ethiopia respectively. Whereas, Bersisa Kumsa and Ajebu Nurfeta (2008), Bersisa Kumsa and Abebe Wossene (2008) reported the presence of anthelmintic resistance in small ruminant nematodes kept by the Hawassa and Haromaya Universities. Therefore, the objective of this study is to investigate the efficacy of albendazole, tetramisole and ivermectin, which are most commonly, used anthelmintics in the study area.

Material and methods

Study areas

The study was conducted in the midland areas of Wolaita Zone in Damot-Gale District, Southern Ethiopia, located at 6.4^0 – 7.2^0 N and 37.4^0 – 38.2^0 E (CSA, 2003). Wolaita Zone receives total annual rainfall of 1112.3mm, and annual mean maximum and minimum temperature of 25.4^0C and 14.5^0C. The average annual humidity ranges from 60.9 – 63.5% (Wolaita Zone Finance and Economic Development Department, 2003).

Study design and study animals

Randomized complete block design was employed for this field experimental study (Gomez and Gomez, 1984). The study animals were randomly selected from the sheep population of Damot Gale district, Wolaita Zone that kept in traditional backyard management system. Selected sheep were randomly assigned in to four groups: the first group 33 sheep for albendazole, the second group 30 sheep for tetramisole, the third group 10 sheep for ivermectin treatment and the fourth group 10 sheep for untreated for control.

Anthelmintic efficacy trial

The sheep used in the current anthelmintics efficacy trial were selected after faecal examination by the modified McMaster egg counting technique (Urquhart et al., 1996) for nematode eggs. Those sheep with greater than 300 eggs per gram of faeces, 83 sheep (43 male and 40 female), were selected for the trial. The selected sheep were grouped into four treatment groups that are the first group (43 sheep) for Albendazole, the second group (40 sheep) for tetramisole, and the third group (10 sheep) for Ivermectin treatment, and the fourth group (10 sheep) left untreated for control. Again the Albendazole and Tetramisole treatment groups were divided into two age groups, those below six months (29 sheep) of age and above six months (34 sheep) of age. Then the sheep were dosed according to the manufacturers' recommendations of Albendazole (Exiptol, ERFAR, Pallini-Attiki, Greece) 7.5gm/Kg, tetramisole (Tetramisole, ERFAR, Pallini-Attiki, Greece) 15mg/Kg and Ivermectin (Ivomec injection, Merial, USA) 0.2mg/Kg. At day 10 of the treatment (Cole et al., 1992) the faecal samples were collected from all groups and analyzed quantitatively.

Statistical analysis

For the data management SPSS version 13 software were used. The difference in EPG between the two counting, pre-treatment and post treatment, were analyzed using the formula described by Dash et al. (1988), arithmetic means, and Presidente (1985), geometric means, of FECR. Nematodes egg counts were subject to logarithmic transformation, [log (x+1)], to stabilize variances (Martin, 1982) and expressed as geometric means for the groups; and also for analysis of variance between age group.

Results

The experimental sheep had high pretreatment faecal egg counts as indicated on Table 1. The result of the arithmetic means; and geometric mean reduction of faecal egg counts that all the anthelmintic drugs used for this experiment were found to be effective.

There is no statistically significant difference between the two sexes, male and female, in mean Log(X+1) before treatment (t =- 1.541, P = 0.129) and after treatment (t = 0. 305, P = 0.761). For the treatment group of Albendazole there is no significant difference between age groups, those less than 6 months and above 6 months, before treatment (t = 1.033, P = 0.306) and after treatment (t = 0.305, P = 0.761) as shown on Table 2.

Table 1. Comparative FECR test using arithmetic and geometric means.

Rx Group	No of Animals	Arithmetic Mean		FECR %	Geometric Mean [Log (X+1)]		FECR %
		Day 0	Day 10		Day 0	Day 10	
AL	33	1769.7 + 367.9	9.1 + 5.1	99.34%	3.08+0.33	0.0	100%
TR	30	1160.0 + 125.8	20.0 + 8.8	97.77%	2.99+0.23	0.0	100%
IV	10	760.0 + 158.6	10.0 + 10.0	98.30%	2.80+0.26	0.0	100%
Control	10	1280.0 + 249.8	990 + 258.8	-	2.99+0.32	2.83+1.07	

Al = Albendazole, TR = Tetramisole, IV = Ivermectin, Rx = Treatment

Table 2 Age and Sex difference for sheep treated with Albendazole

Exam.	Source	Mean Log(x+1)	Std Error mean	95% CI Log(x+1)	t	Sig.
EPG 1	Age <6m	2.992	0.044	2.901 – 3.083	-1.541	0.129
	Age >6m	3.102	0.054	2.992 – 3.213		
	Sex Male	3.050	0.045	2.960 – 3.140	-0.055	0.510
	Sex Female	3.055	0.063	2.924 – 3.185		
EPG 2	Age <6m	0.355	0.147	0.053 – 0. 657	1.033	0.306
	Age >6m	0.176	0.099	-0.109 – 0.309		
	Sex Male	0.333	0.117	0.097 – 0.568	1.261	0.007
	Sex Female	0.100	0.212	-0.109 – 0.309		

Exam = Examination, Sig. = Significance

Discussion

The result of FECR test showed that the anthelmintic resistance was not present for any of the tested anthelmintic drugs. This finding agrees with the studies done by Bersisa Kumsa and Ajebu Nurfeta (2008) in Hawassa, and Kassahun Asmare et al. (2005) in southern Ethiopia on efficacy of anthelmintic drugs against nematodes of sheep that kept by smallholders. Hence, in the study areas the complaint of the farmers (District veterinary clinics, 2007, personal communication) was aroused from faulty balling and/or under dosing the anthelmintic drugs as explained by Cole et al. (1992). Otherwise all the three anthelmintic drugs used for this study were found to be effective against the GIT nematodes of sheep. The finding of this study is in contrast with that of Bersisa Kumsa and Abebe Wossene (2008) observations who reported the presence of resistance in nematodes of small ruminants owned by Hawassa and Haromaya Universities. Albendazole and Tetramisole are the most commonly used anthelmintic drugs in the areas. The age and sex of sheep did not modify the EPG as also described by Cabaret et al. (1998).

Anthelmintic will continue to play a primary role in parasite control in the area for the foreseeable future. As indicated by Waller (1993) there is no need for a radical change in method of nematode control, but a change in attitude. The change in attitude essentially refers to all involved in control of nematode infections, from the farmers, through the Veterinarian and extension personnel in the field (William, 1997). The attitude change is that anthelmintic drug's efficacy must be preserved through judicious and planned treatment time in order to avoid drug resistance.

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