EFFECTS OF FENBENDAZOLE SLOW-RELEASE (SR) BOLUS ON PRODUCTIVITY OF INDIGENOUS CATTLE ON COMMUNAL PASTURE IN SANYATI AREA, ZIMBABWE

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Summary

A study was conducted to determine the effects of treatment with Fenbendazole Slow-Release (SR) bolus on productivity of indigenous cattle on communal pasture in Sanyati area, Zimbabwe. Animals were divided into two groups: 1) Fenbendazole group (animals received the Panacur SR bolus) and 2) Control group (animals did not receive the Panacur SR bolus). Worm eggs per gram of faeces (EPG), packed cell volume (PCV), albumin and live-weight gain were monitored. Faecal worm egg counts were significantly lower in the bolus treated group than in the control group ($p<0.01$). Live-weight gains, PCV and albumin did not differ significantly between the two groups. *Haemonchus* sp. and *Cooperia* sp. were the dominant genera identified on faecal culture.

Introduction

Cattle in the communal areas of Zimbabwe are less productive than those on commercial farms (Ogaa *et al.*, 1992). Gastrointestinal helminths are among the causes of this low productivity (Pandey *et al.*, 1993). In Zimbabwe, cattle kept on commercial farms are usually treated with an anthelmintic at the beginning of the dry season and/or at the beginning of the rainy season (Moyo *et al.*, 1996). In the communal areas on the other hand, anthelmintic treatment is only given to clinical cases and rarely to the whole herd (Pandey *et al.*, 1993). This is mainly because of the scarcity of resources.

Conventional single anthelmintic treatment effectively eliminates the majority of gastrointestinal worms and the already infected herbage to which grazing cattle are exposed is altered little by such treatment and re-exposure to new infections continues if the cattle remain in the same environment after treatment (Prost *et al.*, 1983). The use of intraruminal sustained release bolus has provided a successful

method to remove existing worm burdens and prevent reinfection of a period of up to 150 days (Pfeiffer, unpublished data).

Anthelmintic treatment of subclinical cases of trichostrongylosis in cattle has been shown to result in higher weight gains (Duncan and Forbes, 1992; Hertzberg et al., 1994), improved reproductive performance (Stromberg et al., 1997) and increased milk production in dairy cows (Walsh et al., 1995). Work has been done in Zimbabwe to determine the impact of gastrointestinal parasites on communal area cattle and the results obtained have been variable. While some workers have concluded that endoparasitism may not be a significant health problem in communal area cattle (Bryant and Norval, 1985; Obwolo et al., 1992), others have found them to be of significant importance (Vassilev, 1994 and Moyo et al., 1996).

The objective of this study was to determine effects of treatment with Fenbendazole Slow-Release (SR) bolus on productivity of indigenous cattle on communal pasture in Sanyati area, Zimbabwe.

Materials and methods
Study site
The experiment was carried out in Sanyati communal area which lies in the middleveld of Zimbabwe, 250km west of Harare. Sanyati overlaps between natural regions III and IV.

Most communal areas in Zimbabwe lie within these semi-arid to arid regions. The pastures in Sanyati are generally of poor quality and are overgrazed.

The soil is mainly a ferric luvisol which is severely weathered and characterised by a clay fraction with a low exchange capacity (FAO-UNESCO, 1977). It is poor in organic matter and unsuitable for cropping.

Several villages are scattered in the area, inter-spaced by communal grazing areas. Four villages were randomly selected for this study. The weather data, mean monthly temperatures (minimum and maximum) and mean monthly rainfall, for the area were obtained from the Meteorological Office (Belvedere, Harare).

Study animals
Eighty-eight male and female weaners from different households were initially randomly selected for the study. Due to other commitments and chores at their homesteads which included the preparation of fields for the planting season, most farmers could not manage the additional workload of bringing their animals for regular treatment and weighing and hence only 24 animals had regular attendance for treatment and recording of the study parameters. The animals were mostly of the indigenous Mashona breed which is common among the communal farmers of Zimbabwe. A few Brahman and some crossbreeds were also included in the study. At the beginning of the experiment the average age and weight of the animals was 16 months and 148 kg respectively. The study animals

were dipped once every month during the dry season and fortnightly during the rainy season. No other animals in the villages were dipped.

Anthelmintic

The Panacur SR bolus developed by Hoechst was used in the study. It consists of a specific magnesium alloy in the form of a cylindrical tube of ten discs. Each disc is formulated to contain 1.2 g of fenbendazole. The bolus has a specific gravity 2.5 g/cm^3 which enables it to lodge in the reticulum and release fenbendazole at approximately 80 mg/day, continuously over a period of up to 5 months. The active ingredient, fenbendazole, is an anthelmintic of the benzimidazole group. It is effective against gastrointestinal nematodes, lungworms and cestodes of ruminants, horses, pigs, dogs, and cats. The bolus was administered using the applicator supplied by the manufacturer. This involved placing the bolus into one end of the applicator which was then passed into the oesophagus. Once the end of the applicator was in the oesophagus, the bolus was released by a trigger and the applicator was withdrawn.

Study design

The animals were randomly allocated into two groups according to their live-weight with equal numbers of males and females in each group. The Fenbendazole group (FBZ) received the Panacur SR bolus twice, in July 1996 and December 1996 and the control group (CON) remained as untreated controls. Study animals were ear-tagged for identification and were kept by their owners together with the rest of their herds. They grazed on the same communal pastures as all other animals from the villages. Rectal faecal samples and jugular blood samples were collected from the animals once every two months. The animals were also weighed monthly, using a scale. Albumin was determined using methods as described by Henry *et al.*, (1974) and packed cell volume (PCV) were determined by standard procedures.

Parasitological procedures

The modified McMaster technique (Ministry of Agriculture, Fisheries and Food, 1986) was used for determination of worm egg counts per gram of faeces. To determine the genera of nematodes affecting the study animals, group faecal samples were pooled in glass jars for culture. Standard procedures for the preparation of faecal cultures were followed (Ministry of Agriculture, Fisheries and Food, 1986). One hundred larvae from each group were differentiated using the larval identification key of Ministry of Agriculture, Fisheries and Food (1986).

Statistical analysis

The data were analysed using the Statistix computer programme (version 1.0). Faecal egg counts were log transformed to logarithm(count+1) to calculate the geometric mean. The t-test was used to compare the two groups and the 5%

significance level was used to determine whether the parameters measured differed between the treatment group and the control group.

Results

Meteorological data

The weather data are given in Figure 1. Above average rainfall (1069 mm) was received in the area during the 1996/1997 rainy season. Minimum and maximum temperatures were within the normal ranges for the area.

Faecal worm egg counts

Figure 2 shows the geometric mean faecal worm egg counts for each month. There was a significant difference in the overall mean EPG between the FBZ and the CON groups (p<0.01) (Table 1). In the control group, the egg counts peaked in the month of February and declined to reach their lowest levels in June. In the FBZ group, egg counts were at or near zero throughout the study period.

Table 1: Comparison of mean ± standard error, for eggs per gram of faeces, weight gain, packed cell volume and albumin between the FBZ and CON groups (values in parentheses depict the range).

Group	n	EPG (GM)	weight gain (Kg)	Mean PCV (%)	Mean albumin (g/l)
FBZ	12	$3.2^a \pm 1.26$ (0–588)	$11.3^a \pm 5.83$ (2.8–37)	$30.7^a \pm 0.47$ (21–38)	$32.4^a \pm 0.62$ (22–44.7)
CON	12	$24.1^b \pm 1.35$ (0–831)	$14.9^a \pm 4.56$ (0.9–30)	$29.6^a \pm 0.43$ (23–37)	$30.8^a \pm 0.58$ (16.6–40.4)

Values without a common superscript letter within a column are significantly different (p<0.05).

Faecal larval differentiation

Figures 3A – D show the frequency of infective larvae (L_3) by genera from faecal cultures of the treated group and control group. *Haemonchus* sp and *Cooperia* sp were the dominant nematode genera and *Trichostrongylus* sp and *Oesophagostomum* sp were found in low levels. No larvae were recovered from cultures of the FBZ group until April when *Cooperia* sp, *Haemonchus* sp and *Trichostrongylus* sp were recovered.

Live-weight gains

Figure 4 shows the mean cumulative live-weight gains of the animals for the duration of the study. At the end of the study there was no significant difference in the mean live-weight gain between the FBZ and CON groups (see Table 1).
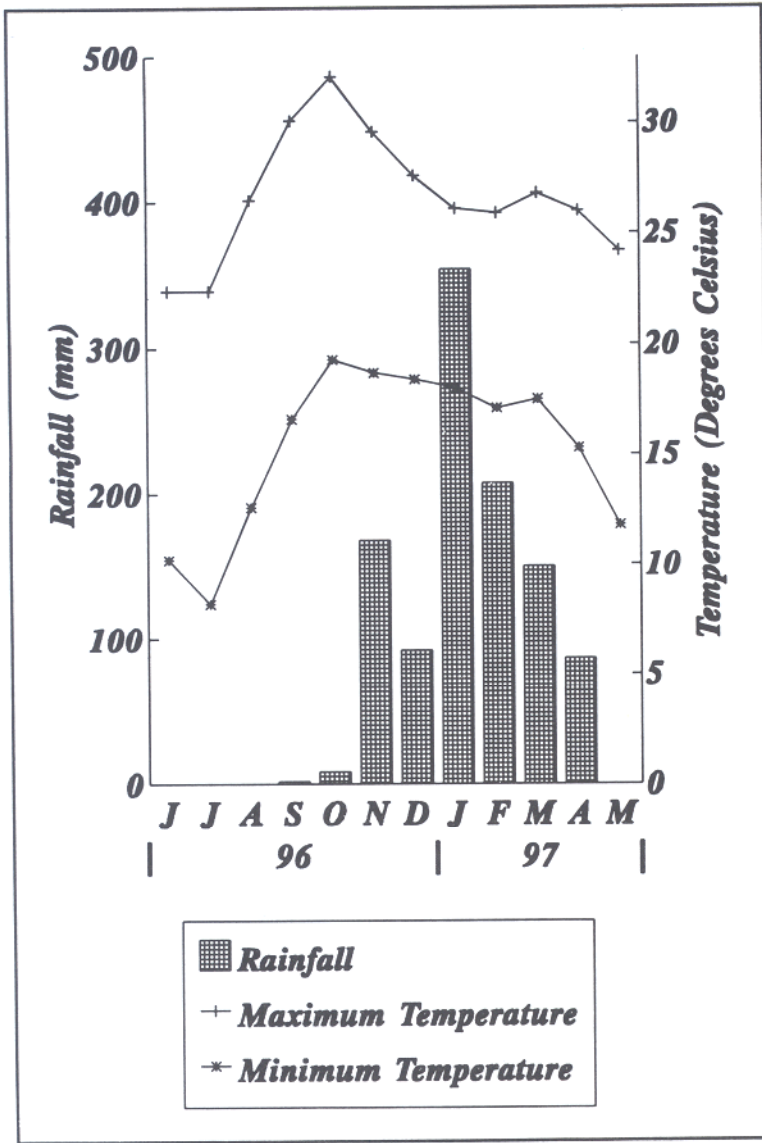
Figure 1: Mean monthly rainfall and mean monthly temperatures (minimum and maximum) at Sanyati during the study period.
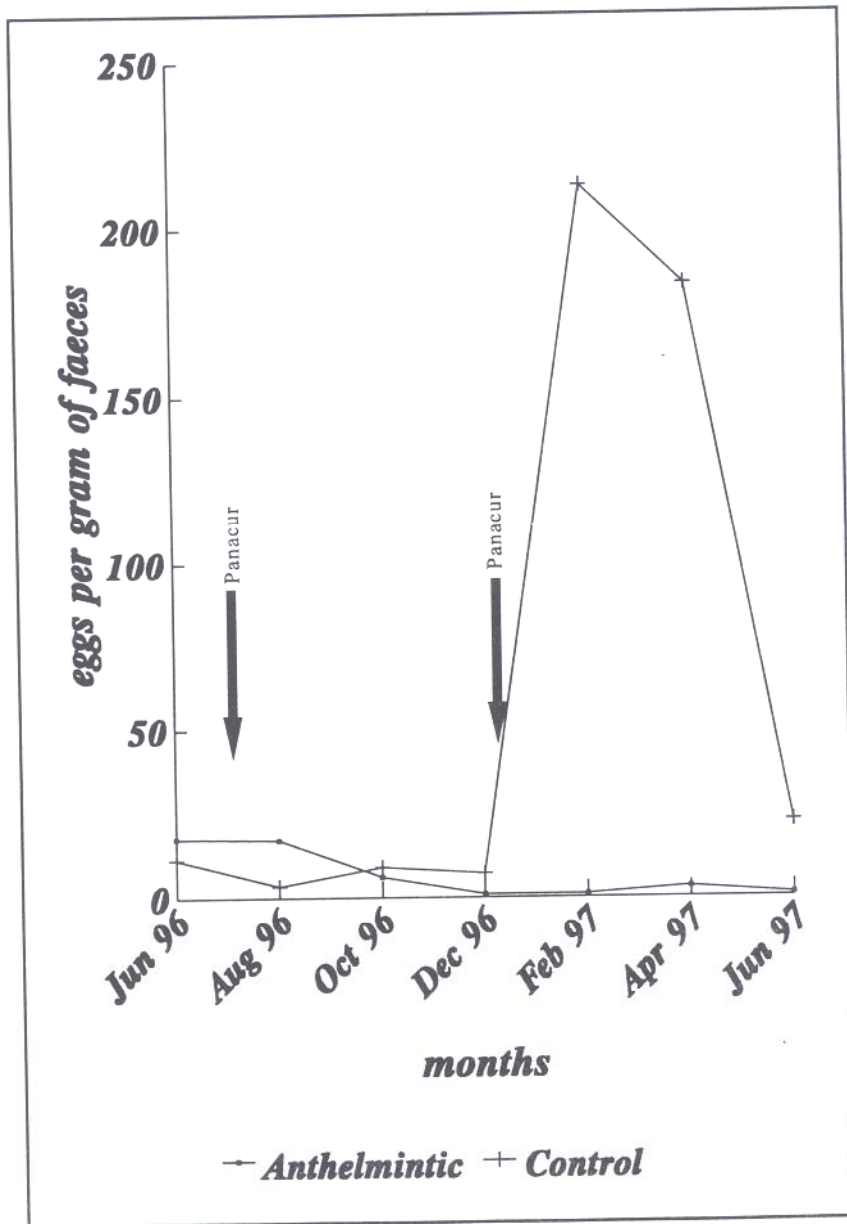
Figure 2: Geometric mean faecal egg counts of the treated group (FBZ) and the control group (CON) over the study period.
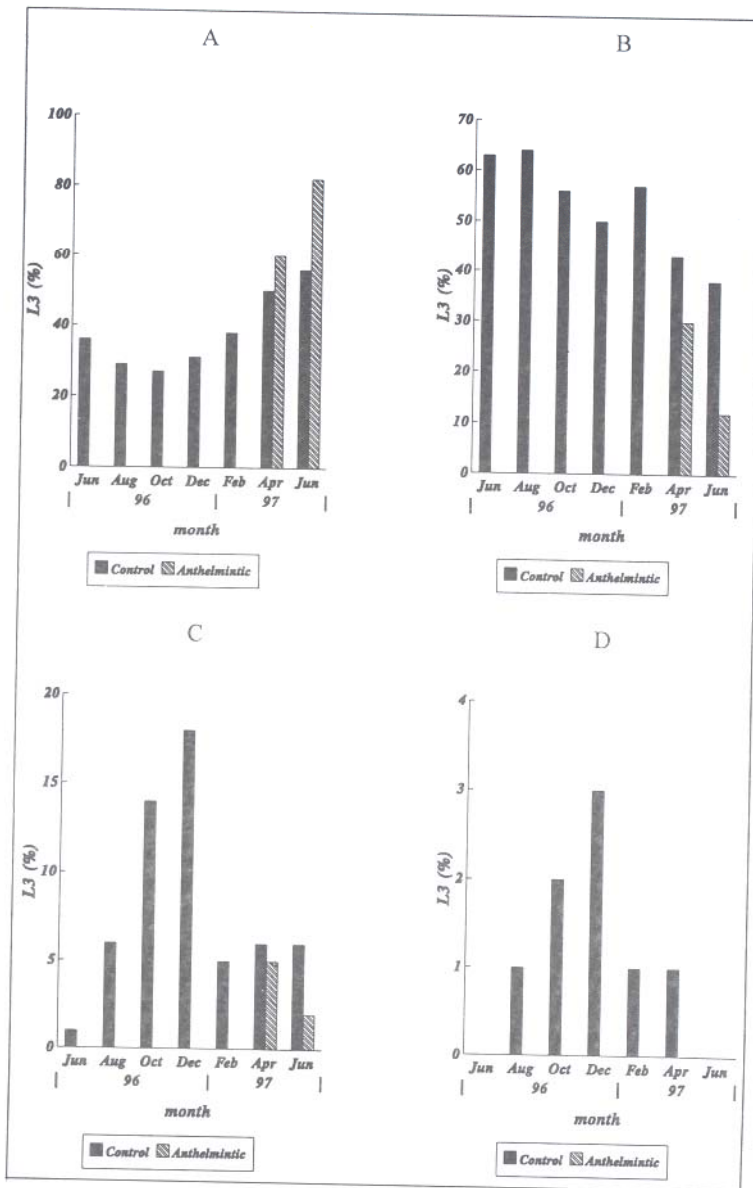
Figure 3: Frequency of L3s on faecal cultures: (A) *Haemonchus* sp. (B) *Cooperia* sp. (C) *Trichostrongylus* sp. (D) *Oesophagostomum* sp.
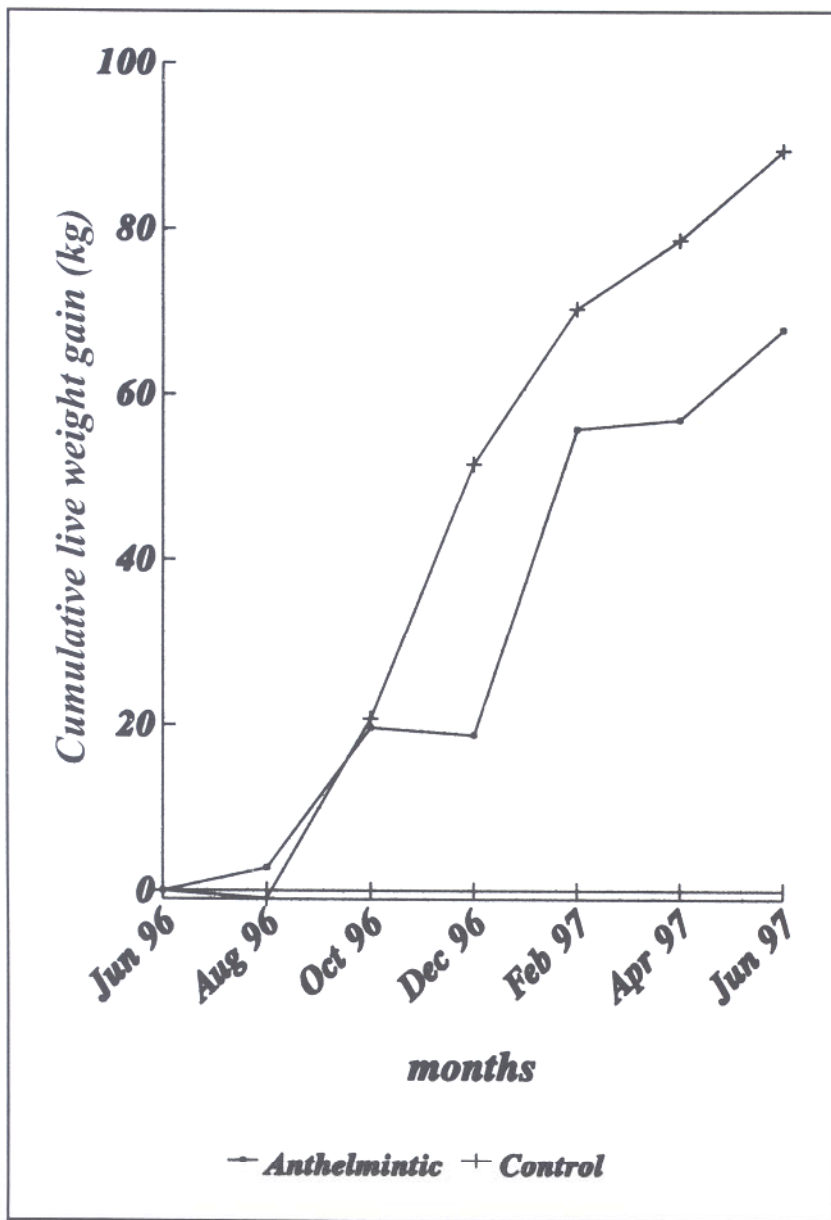
Figure 4: Mean cumulative live-weight gains of the treated group and the control group during the study period.

Blood parameters

The anthelmintic treated animals had higher mean PCV and albumin values but the differences were not statistically significant (see Table 1).

Discussion

Sanyati area normally receives an average of 600–800 mm of rainfall per annum. The above average rainfall received during the 1996/97 rainy season can be attributed to the El Nino phenomenon which resulted in excessive rains in some parts of the country and drought conditions in other parts. The unusual rains resulted in availability of forage in Sanyati area during some of the months normally considered as dry.

Faecal egg counts of control animals followed a seasonal pattern with a peak during the rainy season and this is in agreement with studies by Chiejina and Fakae (1984), Pandey *et al.* (1993) and Moyo *et al.* (1996). The egg counts declined during the dry months of May to October.

It should be noted that the faecal egg output of the control animals was generally low (averaging 24.1 for the study period). This could be suggestive of an effective functional immunity or resistance to parasite challenge (Ryan *et al.*, 1997) in cattle from the communal areas.

The Panacur slow release bolus significantly reduced faecal worm egg counts in the treated group. This is in agreement with the findings of Bauer (1993) where treatment of cattle with the bolus led to significantly lower egg counts than in the controls. The treated animals began shedding worm eggs in their faeces before the expected five months as indicated for the remedy. This might be because they were grazed together with the rest of the untreated village herd. It has been shown that grazing bolus treated and untreated animals together results in an earlier rise in egg count, 12 weeks compared to 22 to 27 weeks in separately grazed animals (Bauer, 1993). For maximum benefits to be realised from anthelmintic treatment it is therefore important that all animals that graze on the same pasture be treated with the anthelmintic (Bauer, 1993).

The genera identified from faecal culture in the present study are known to occur in Zimbabwe (Pandey *et al.*, 1993; Moyo *et al.*, 1996).The absence of *Bunostomum* sp was surprising considering that it has been found to occur in Zimbabwe (Moyo *et al.*, 1996). This parasite was also absent in cattle from Chinamora communal land (Pandey *et al*, 1993). Probably the distribution of the parasite is focal, affecting specific farms and localities. No larvae were recovered from cultures of the treated group until April when the effect of the second bolus was wearing off. *Oesophagostomum* sp which had been observed in low levels (1–3%) in the control group were absent from the treated group.

No significant increases in productivity parameters were observed after anthelmintic treatment. This is in direct contrast to findings by other workers in the Gambia where trials with village N'Dama cattle showed that annual weight gains in 2–3 year olds improved by 18–33% when the cattle were treated twice with

fenbendazole or morantel during the rainy season (Zinsstag *et al.*, 1992; Zinsstag *et al.*, 1993).

The results obtained in the present study may have been because levels of gastrointestinal nematode infections in cattle from the Sanyati communal area were too low to have any impact on the productivity of the cattle (Bryant and Norval, 1985). Inadequate nutritional intake of the animals might be another factor that may have contributed to the findings in this study. It has been shown that under conditions of sub-optimal protein intake, nematode infection in the growing animal can continue to affect production even after efficient anthelmintic treatment (Parkins *et al.*, 1982). It should therefore be emphasised that any anthelmintic treatment regimen may not be effective unless the nutritional regimen of the animals is also improved. In general, pastures in the communal areas of Zimbabwe are of poor quality, overstocked and overgrazed (Pandey *et al.*, 1993).

The results of this study therefore suggest that there are no production gains obtained as a result of anthelmintic treatment of subclinical cases of gastrointestinal nematodosis in cattle from the Sanyati communal area.

Acknowledgements

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