Research Application Summary

Effect of crude extracts of *Viscum verrocosum* treatment on nematode parasite faecal egg count in female Tswana goats

Moncho, T.[1], Madibela, O.R.[1], Machete, J.B.[1], Bonang, V.[1] & Motlhanka, D.M. T.[1]
Department of Animal Science and Production, Botswana College of Agriculture, P/Bag 0027, Gaborone, Botswana
Department of Basic Sciences, Botswana College of Agriculture, P/Bag 0027, Gaborone, Botswana
Corresponding author: omadibel@bca.bw

Abstract

The present study was carried out at Notwane Farm of Botswana College of Agriculture with local Tswana goats. Goats graze and browse on a mixture of Acacia savanna with broad-leaved middle layer trees with no or little supplementation. Infestation with nematode parasites is one of the factors that impinge on growth of goats and also increase healthcare costs. Various concentrations of traditional medicine derived from mistletoe (*Viscum verrocosum*) extracts were orally administrated to nematode infested goats. The excreta of control animals (dosed with distilled water) had significantly ($P < 0.05$) high worm eggs than those dosed with an anthelmintic drug (Valbazen) and crude extract of *V. verrocosum* at concentration rates of 130, 260 or 500 g/l (1828, 913, 780, 1089 and 945epg respectively). There was also a highly significant ($P < 0.001$) treatment x time interaction for faecal worm eggs due to higher faecal egg counts, at various time points, from control goats than other treatment groups. There was no significant difference ($P > 0.05$) in live weight of goats from different treatments probably indicating resilience of Tswana goats to nematode parasites. This plant was previously found to contain high concentration of condensed tannins which may be responsible for its action on nematode parasites. This preliminary dosing trial confirms previous studies on the efficacy of *V. verrocosum* in reducing feacal egg count in Tswana goats.

Key words: Condensed tannins, mistletoe, nematode parasites, Tswana goats

Résumé

La présente étude a été réalisée à la ferme de Notwane du Collège des Sciences Agronomiques du Botswana sur des chèvres locales du Tswana. Des chèvres paissent et broutent sur un mélange de savane des acacias faits des feuillus de couche intermédiaire sans ou avec peu de supplémentation. L'infestation par les parasites nématodes est l'un des facteurs

qui affectent la croissance des chèvres et qui augmentent aussi les coûts des soins de santé. Diverses concentrations de la médecine traditionnelle provenant des extraits de gui (*Viscumverrocosum)* ont été administrées par voie orale à des chèvres infestées de nématodes. . Les excréments des animaux témoins (traités avec de l'eau distillée) avaient significativement (P <0,05) plus d'œufs de vers que ceux traités avec un médicament anthelminthique (Valbazen) et un extrait brut de *V. verrocosum* à des taux de concentration de 130, 260 ou 500 g / l (1828, 913, 780, 1089 et 945epg respectivement). Il y avait aussi un traitement hautement significatif (P <0,001) et une interaction temporaire pour les œufs de vers fécaux due à un nombre plus élevé d'œufs fécaux, à divers moments, des chèvres témoins que les autres groupes de traitement. Il n'y avait pas de différence significative (P> 0,05) de la charge utile des chèvres de différents traitements sans doute indiquant la résilience des chèvres de Tswana aux parasites nématodes. Cette plante est reconnue de contenir une forte concentration de tanins condensés qui peuvent être responsables de son action sur les parasites nématodes. Cet essai de traitement préliminaire confirme les études antérieures sur l'efficacité de *V. verrocosum* dans la réduction du nombre des œufs fécaux chez les chèvres de Tswana.

Mots clés: tanins condensés, gui, parasites nématodes, chèvres de Tswana

Background

The maim impediments of productivity of small ruminants in Botswana are poor nutrition, internal parasites and lack of markets. Control of internal parasites is heavily reliant on synthetic anthelmintic drugs which are expensive for resource-limited farmers. The continued reliance on anthelmintic drugs is also becoming unattractive due to potential occurrence of residues in animal products and contamination of the environment. Coupled with these sentiments is the current development of resistance of nematode parasites to these drugs. The use of traditional plants to control internal parasites in livestock production opens opportunities for sustainable and less frequent use of anthelmintic drugs (Madibela and Kelemogile, 2008). However, novel ways of administration of the plants and dosage levels are still needs to be determine.

Literature Summary

Pasture based production systems of the world are faced with challenges of nematode parasites (Hoste *et al.*, 2006) especially in small ruminant production and in particular for *Haemonchus*

contortus (Diehl *et al.*, 2004) and *Trichostrongylus colubriformis* (Bizimenyera *et al.*, 2006). Successful production requires that gastrointestinal nematodes be effectively controlled (Min *et al.* (2004). Otherwise parasitism would impair health by causing depression in feed intake, diarrhoea, anaemia, and in severe cases death (Anthanasiadou and Kyriazakis, 2004). Over the years, the mainstay of parasite control has been achieved through repeated use of chemotherapy (Hoste *et al.*, 2006). However, it has recently emerged that parasites are developing resistance to anthelimintic drugs (Hounzangbe-Adote *et al.*, 2005a). Due to development of this high level of resistance, farmers in some parts are force to abandon livestock farming (Waller,2005). Other reasons which make the use anthelmintic drugs less appealing are that in developing countries, like Botswana, these are expensive (Hounzangbe-Adote *et al.*, 2005b) and the possibility of drug residues entering the food chain (Athanasiadou and Kyriazakis 2004). Alternative control of nematode parasites is being investigated, including the use of plants containing secondary compounds. Bioactive plants that have shown promise contain condensed tannins (Hoste *et al.*,2006, Min *et al* 2004, Madibela and Jansen, 2003, Niezen *et al.*, 1998). These secondary compounds work by either directly affecting the hatching of parasite eggs or interfering with early development of the larvae.

Study Description

This study was carried out from Notwane Farm of Botswana College of Agriculture with local Tswana goats. Mean annual rainfall for the area is about 500 mm. Monthly averages minimum and maximum temperatures are 12.8 and 28.6^{o} C, respectively. The vegetation type of the farm is a mixture of Acacia savanna with broad-leaved middle layer trees like *Combretum apeculatum, Burkea africana, Boscia albitrunca, Ziziphus mucronata*. The ground layer is covered with grasses such as *Eragrotis* species, *Panicum maximum, Digitaria malinjiana* and *Urochloa* species. Goats graze and browse on these vegetation with no or little supplementation. Twenty five one year old female goats infected with nematodes were randomly selected. The animals were blocked into groups according to initial live weight and faecal egg counts. The groups were randomly allocated into five treatment groups; (i) the control group (drenched with distilled water; n = 5: FEC; 4280±885epg: LW; 23.2±1.55kg), (ii) dosed with a drug (Valbazen; Albendazole, 1.9% m/v; Pfizer South Africa; n = 5: FEC; 4370±885epg: LW; 23.2±1.55kg); (iii) *Viscum verrocosum* (VV) at concentration of; 130g/l (VV130: n = 5: FEC; 4300±885epg:

LW; 23.2±1.55kg), (iv) 260g/l (VV260; n = 5: FEC; 4240±885epg: LW; 21.0±1.55kg); (v) 500g/l (VV500; n = 5: FEC; 4210±885: LW; 21.4±1.55kg). The animals were first dosed on day 27 after starting the trial and then weekly for plant extracts but monthly for the drug. The animals were ear tagged and allowed to graze with the rest of the flock. This was meant to simulate every day conditions in sheep and goat production in Botswana. *Viscum verrocosum* plant was collected around the farm, dried under shade and ground into a powder, mixed with distilled water at different weights to give desired concentrations. Goats were then orally dosed weekly at a rate of 4ml/animal according to respective treatments. This is the same rate at which the commercial drug was administered (2ml per 10kg live weight) every 6 weeks. The Control group was given a placebo of 4 ml/animal of distilled water. Faecal egg counts were made every week. Animals were weighed at the beginning of the experiment and weekly thereafter. Analysis for condensed tannins is still going on.

Research Application

Mean weekly faecal egg count, live weight and daily gain are shown in Table 1. Control animals excreted faeces with significantly ($P < 0.05$) high worm eggs than those dosed with an anthelmintic drug, crude extract of *V. verrocosum* at concentration rate of 130, 260 or 500 g/l. There was no difference ($P > 0.05$) in mean live weights of goats of different treatments.

Table 1. Mean weekly back-transformed FEC (epg) and live weights (kg) of naturally infected Tswana yearly female goats dosed with varying concentrations of crude extract of *V. verrocosum*.

	n	Faecal egg count (epg)	Live weight (kg)
Control	5	1828[a]	22.5
Anthelmintic drug	5	913[b]	22.5
VV130	5	780[b]	21.4
VV230	5	1089[b]	21.0
VV500	5	945[b]	21.0
Standard error		0.19	1.52
SL (Trt)#		*	NS
SL (Trt x Time)		***	NS

NS = not significant; * = $P < 0.05$; ** = $P < 0.001$, Trt = Treatment.

Time series data (faecal egg count) is shown in Figure 1. There was a highly significant ($P < 0.001$) time x treatment effects on faecal egg count. This was due to high ($P < 0.05$) FEC observed from VV260 than control animals at day 30 and higher FEC

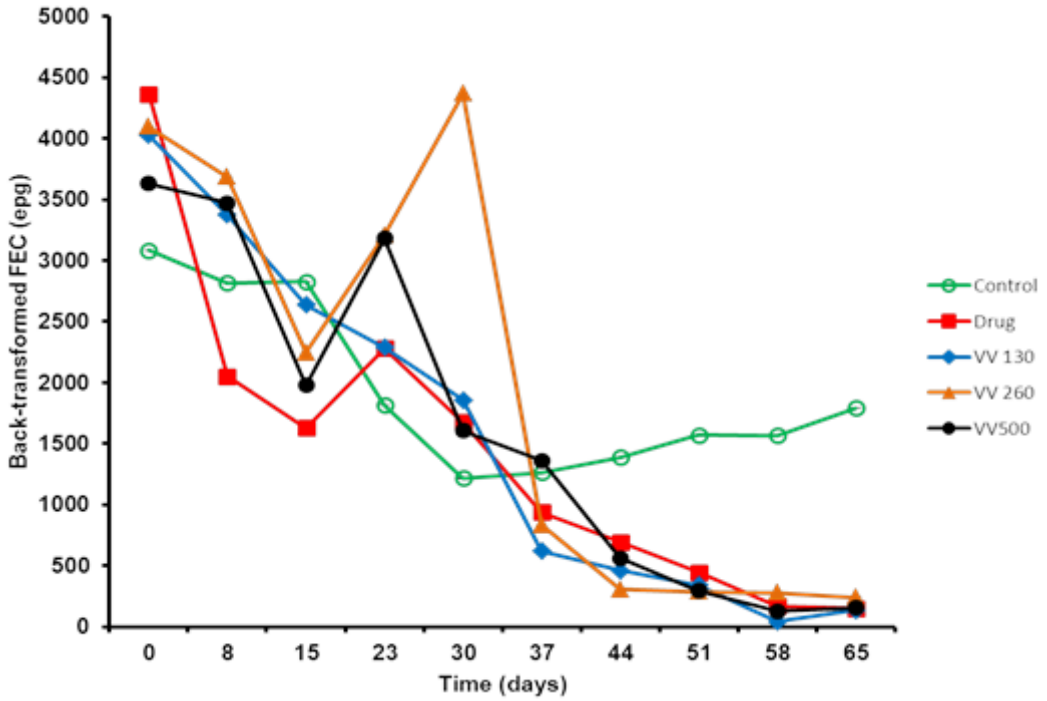

Figure 1. Mean back-transformed FEC of yearly Tswana naturally nematode infected female goats dosed with varying concentrations of crude extracts of *V. verrocosum*.

recorded from control goats than VV260 goats at day 44 ($P < 0.01$), highly significantly low FEC from control than drug, VV130, VV260 and VV500 animals at day 51 and day 65 ($P < 0.001$). At day 58,control goats excreted faeces with significantly higher egg count than animals dosed with anthelmintic drug ($P < 0.01$), dosed with 130g/l ($P < 0.001$), dosed with 260g/l ($P< 0.05$) or 500g/l ($P < 0.001$). These results shows that crude plant extracts from *V. verrocosum* can reduce faecal eggs count indicating possible action of condensed tannins on the fertility of worms or the worms themselves.

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