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Effects of condensed tannin from *Acacia mearnsii* on sheep infected naturally with gastrointestinal helminthes

F.B. Cenci [a], H. Louvandini [a,*], C.M. McManus [a], A. Dell'Porto [a], D.M. Costa [a], S.C. Araújo [a], A.P. Minho [b], A.L. Abdalla [b]

[a] *Faculdade de Agronomia e Medicina Veterinária, Universidade de Brasília, Distrito Federal, CP 04508, Brasília 70910-900, Brazil*
[b] *Centro de Energia Nuclear na Agricultura, Universidade de São Paulo, Piracicaba, Avenida Centenário 303, São Paulo 13400-970, Brazil*

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Abstract

The effect of tannins on endoparasite control in hair sheep was investigated using 20 entire lambs of the Santa Inês breed. At the beginning of the experiment these animals were 6-months old and weighed 22.5 kg ± 4.7. The treatments used were (10 animals each): GT (animals receiving 18 g of *Acácia negra* containing 18% of condensed tannin/animal/week) and GC (animals not receiving tannin). The experiment lasted 84 days, with animals kept on an *Andropogon gayanus* pasture. Faeces were collected weekly, with weighing and blood collection carried out fortnightly. At slaughter, the adult worms were harvested for identification and counting. Although the GT animals weighed more than the GC lambs at slaughter, these differences were not significant ($P > 0.05$). In general, the values for haemoglobin, hematocrit, total protein, urea, phosphorus and calcium in the serum were within normal levels and no significant differences between groups were observed. For faecal egg count (FEC), lower values were observed throughout the experiment in the group receiving tannin, but these differences were only significant in the eighth week. There was a lower output of eggs by regression for GT compared with GC ($P < 0.05$). The species identified, in decreasing order of worm count, were: *Trichostrongylus colubriformis*, *Haemonchus contortus*, *Oesophagostomum columbianum*, *Cooperia* sp., *Strongyloides papillosus*, *Trichuris globulosa* and *Moniezia expansa*. The total worm count and number of each species of worm were lower for GT compared with GC for *T. colubriformis* and *Cooperia* sp. ($P < 0.05$). Condensed tannin (CT) from *A. negra* had an antiparasitic effect, thereby representing an alternative for worm control in sheep.

Keywords: Hair sheep; Ruminant; Egg count; Nematodes

1. Introduction

Most of the sheep herds in South America are reared extensively, almost exclusively on natural pastures and in regions where the climate favours the development of gastrointestinal parasites (Echevarria et al., 1996). *Haemonchus contortus*, *Cooperia* sp., *Trichostrongylus* sp., *Moniezia expansa* and *Oesophagostomun* sp. are the most commonly found species. The infection is usually of mixed nature, and together with unsuitable sanitary and nutritional management of the animals, this culminates in considerable economic losses.

According to Niezen et al. (1995), the use of forages rich in condensed tannins (CT) has been indicated as an alternative measure in the control of helminths in sheep, reducing the use of chemicals and resulting in lower costs and better flock handling. Tannins are part of the group of polyphenol substances, which contain factors affecting the taste of food and availability of proteins.

* Corresponding author. Tel.: +55 61 3307 2805; fax: +55 61 3273 6593.
E-mail address: hlouvand@unb.br (H. Louvandini).

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Their presence in the plant provide protection against predators (insects, birds and herbivores), nematodes, fungi and bacteria, among others.

In a recent review, Min et al. (2003) concluded that, in moderate concentrations in temperate forages containing CT, these could be used to promote an increase in the efficiency of protein digestion in ruminants and therefore result in better sanitary conditions of the herd. These effects are not the same for all condensed tannins and are dependent on their concentration and chemical structure.

The use of forages containing CT may decrease dependency on the use of anthelmintics, thereby slowing down selection for the development of resistance. This study was carried out to evaluate the effect of condensed tannins present in the bark of *Acácia negra* (*Acacia mearnsii*) on natural worm infections of sheep on pasture.

2. Materials and methods

2.1. Local and animals

This experiment was carried out at the Sheep Research Center on the Água Limpa Farm of the University of Brasília. Twenty, 6-month-old, entire male Santa Inês lambs weighing 22.5 kg ± 4.7 were used. They were randomly distributed between two treatments ($n = 10$ per treatment), after which they were weighed (LW) and underwent faecal egg count (FEC). The GT group received 18 g of powdered *A. negra* (*A. mearnsii*) bark orally, dissolved in water once a week for 13 weeks. This powder contained 18% CT. The control group (GC) animals did not receive any *A. negra*. This protocol (quantity and frequency of CT offer) was drawn up so as not to affect total protein uptake of both groups. Initially, the lambs for GC had 310 FEC and GT, 160 FEC, and they were dewormed immediately (Closantel and Levamizol Cloridrate).

2.2. Feeding and experimental procedures

All animals were kept on an *Andropogon gayanus* pasture, at a stocking rate of five animals per hectare and supplemented with a mineral salt *ad libitum*. Forage was sampled monthly, using random cuts, simulating the feeding habits of the animals. Bromatological analyses were carried out for dry matter (DM), crude protein (CP), ether extract (EE) and ash content (A) using Association of Official Agricultural Chemists (AOAC, 1995) procedures and neutral detergent fiber (NDF) and acid detergent fiber (ADF) according to Van Soest et al. (1991). Faeces samples were collected weekly, for parasitological examination, and blood samples fortnightly, for haematological and biochemical exams. Animals were also weighed fortnightly.

2.3. Faeces and blood analysis

The faeces samples were collected directly from the rectum to determine FEC using the modified McMaster technique (Whitlock, 1948). Blood was collected by jugular puncture and divided in two sterile glass flasks (5 ml), one containing etylenodiaminotetracetic potassium acid (EDTA) for hematocrit determination (cell volume) using the microhematocrit method and haemoglobin (colorimetric method). In the other flask, the blood was kept without an anti-clotting agent to obtain serum which was stored at −20 °C in polyethylene flasks for later determination of total protein, albumin, urea, glucose, phosphorus and calcium using colometric methods, using a commercial Labtest (Diagnóstica S.A.® Lagoa Santa, MG) kit.

2.4. Slaughter and worm count procedures

The animals underwent a 24 h fast before slaughter, receiving only water. Slaughter was carried out by slitting the throat, and the viscera were removed immediately. The abomasum and the intestines (small and large) were tied to avoid the movement of content between parts, and put into identified plastic bags and taken to the laboratory. Each portion of the intestine was separated and opened, the content removed and mucosa washed for worm recovery. A 10% volume aliquot was taken in duplicate from both the abomasum and the small intestine, while all the content was removed from the large intestine. Formalin at 10% was added to this material for later adult worm identification and counting.

2.5. Statistical methods

The experimental design was fully randomised with two treatments (with and without tannin), and ten repetitions. The analysis of variance was carried out using the general linear model (GLM) with repeated measurements procedure of SAS (1996). The dependent variables included live weight, FEC, cell volume, haemoglobin, total protein, albumin, urea, glucose, phosphorus and calcium. For the accumulated FEC, linear and quadratic regression for date and length of time of test was carried out. The FEC and worm count were transformed by $\log_{10}(x + 10)$ and differences at the 5% level were considered significant.