Archivos Latinoamericanos de Producción Animal (Arch. Latinoam. Prod. Anim.)
www.alpa.org.ve/ojs.index/php

Nutritional potential of tannin extracts for ruminants

G. V. Kozloski[1] and F. Hentz

Departamento de Zootecnia, Universidade Federal de Santa Maria, Santa Maria, 97105-900, Brasil.

Potencial nutricional de estratos taníferos para rumiantes

ABSTRACT. The effect of including levels of *Acacia mearnsii* tannin extract in ruminant diets was studied *in vivo* with wethers and steers and *in vitro* by incubating pure samples of crystaline cellulose, calcium caseinate and starch. Total tannin content in this extract was 460 g/kg dry matter (DM), most of them (i.e. 0.88) as hydrolysable tannins. Tannins negatively affected *in vitro* fermentation of cellulose and significantly reduced digestible OM intake in wethers, whereas duodenal supply of á-amino N remained unaffected.

Key words: Ruminal fermentation, Protein degradability, Tannins

RESÚMEN. El efecto de la inclusión de niveles de extracto tanífero de *Acacia mearnsii* en dietas para rumiantes fue estudiado *in vivo* en corderos y novillos y *in vitro* incubándose muestras puras de celulosa cristalina, caseinato de calcio y almidón. El contenido total de taninos en este extracto fue 460 g/kg de matéria seca, la mayor parte como taninos hidrolizables (i.e. 0.88). Los taninos afectaron negativamente la fermentación *in vitro* de la celulosa y significativamente redujeron el consumo de materia orgánica digestible en corderos, mientras el flujo duodenal del nitrógeno á-amino no fue afectado.

Palabras clave: Fermentación ruminal, degradabilidad protéica, Taninos

Introduction

In most production systems and feeding practices, ingestion of rumen degradable protein exceeds rumen microbial requirements as such high proportions that feed N is lost as ammonia absorbed from rumen and excreted as urea in urine and animal performance can be compromised due to a limited supply of metabolizable protein.

Tannins are water-soluble polyphenolic plant compounds which complex mainly with dietary proteins and microbial enzymes showing the potential of reduce ruminal ammonia concentrations and improve flow of non-ammonia N to the small intestine. However, they can also reduce feed intake and digestibility (Makkar, 2003). There are two types, hydrolysable (HT) and condensed tannins (CT). Hydrolysable tannins are more soluble in water and usually consist of a polyol core (such as glucose), partially or totally esterified to either gallic acid (gallotannins) or ellagic acid (ellagitannins), which are susceptible to enzymatic hydrolysis. Condensed tannins are polymers of flavan-3-ol units (proanthocyanidins) linked by carbon-carbon bonds that are not susceptible to anaerobic enzyme degradation (Waghorn, 2007).

Most published research regarding the effect of tannins on intake, digestion and animal performance was conducted with tropical or temperate forage legumes, which have tannins as natural plant compounds, and have focused on CT effects. The impact, although not the mechanisms, of CT on ruminant nutrition is relatively known. In general the chemical structure, concentration and biological effects of CT are broadly variable within and among forage species, which hinders the dietary management of these compounds. In turn, vegetable tannin extracts, as from Quebracho or Acacia trees, are widely available and could be used as feed additives to modulate rumen fermentation.

The use of *Acacia meanrsii* tannin extract was evaluated in *in vitro* and *in vivo* trials. In vitro fermentation of pure cellulose, but not of starch or casein, was strongly and negatively affected by the

[1]Autor para la correspondencia, e-mail: kozloski@smail.ufsm.br

inclusion of the extract at levels varying from 20 to 100 g/kg DM (results not shown). In wethers receiving fresh ryegrass *ad libitum* and intraruminally infused with *Acacia mearnsii* tannin extract at a rate of 20, 40 or 60 g/kg of DM intake, a significant negative effect on digestible OM intake was observed whereas duodenal flow of á-amino N remained unaffected (Figure 1).

In another experiment in which steers were fed fresh oat grass (15 g/kg body weight (BW), DM basis) and a concentrate (10 g/kg BW) containing 200 g/kg of crude protein and 0, 20, 40 or 60 g/kg of tannin extract, no differences were observed on OM digestibility (results not shown). These results raise positive perspectives on the use of the extract, particularly in dairy cattle diet. However, whether or not duodenal flow of amino acids increased in tannin treatments needs still to be measured.

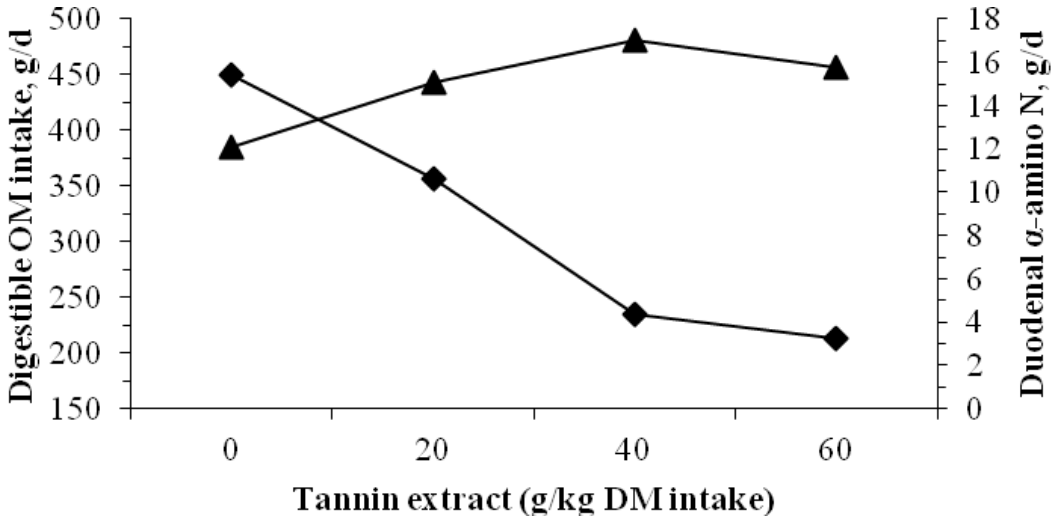

Figure 1. Digestible organic matter (OM) intake (◆) and duodenal flow of á-amino N (▲) in wethers fed fresh ryegrass *ad libitum* and intraruminally infused with *Acacia* tannin extract al a rates of 0, 20, 40 or 60 g/kg of dry matter intake.

Cited Literature

Makkar, H.P.S. 2003. Effects and fate of tannins in ruminant animals, adaptation to tannins, and strategies to overcome detrimental effects of feeding tannin-rich feeds. Small Rum. Res. 49:241:246.

Waghorn G.C. 2008. Beneficial and detrimental effects of dietary condensed tannins for sustainable sheep and goat production – progress and challenges. Anim. Feed Sci. Technol. 147:11