INIAP
Instituto Nacional de Investigação Agrária e das Pescas

EZN

N18.43

Effect of *Cistus ladanifer* L. tannins on digestion, ruminal fermentation and microbial protein synthesis in sheep.

Maria T.P. Dentinho*, Ana T. Belo, Rui J.B. Bessa
Estação Zootécnica Nacional, 2005-048 Vale de Santarém, Portugal
* ***nutricao.ezn@mail.telepac.pt***

Tannins

- Phenolic plant secondary compounds
- Ability to bind proteins
- Adverse or beneficial effects in ruminant animals depending on their concentration, nature, animal species, physiological state of the animal.

Adverse effects

Decrease the palatability and feed intake
Decrease the nutrient utilisation
Decrease the animal performance
Lesions of the gut mucosa and direct toxicity

Beneficial effects

Increase digestive utilisation of dietary proteins for ruminants
⇒ decrease on rumen protein degradation
⇒ increase the flux of potential feed protein into the post ruminal compartments
⇒ digestion and absortion of protein in small intestine

OBJECTIVES

Measure the effect of a purified extract of tannins of *Cistus ladanifer* L. on:

- ruminal degradability,
- Fermentative parameters
- intestinal and apparent digestibility
- rumen microbial protein synthesis in sheep.

CONCLUSIONS

In this study the level of tannins included did not cause the desirable rumen effects:

- the flux of feed protein into the post-ruminal compartments did not increase and
- the microbial protein yield decreased.

Table 1. Chemical composition of soybean meal treated with different doses of a tannin extract of *Cistus ladanifer* L. (n = 3).

	Experimental diets			SIG[1]
	S0	**S1.5**	**S3**	
DM (%)	88.2	87.8	82.2	NS
N (%DM)	7.43	7.57	7.33	NS
Soluble N (%N)	11.8 [a]	7.70 [b]	7.20 [b]	***
N-ADF (%N)	1.51	1.85	2.23	NS
NDF (%DM)	15.4 [b]	17.1 [ab]	18.5 [a]	*

[1] SIG – Significance, NS - not significant, * P < 0.05, ** P< 0.01, *** P<0.001; means in the same row with different superscripts differ significantly (P<0.05).

Table 2. Nitrogen (N) intake and excreted in feces and urines, apparent nitrogen balance, ruminal degradation parameters of protein, effective degradability at k= 0.08.h-1 (ED), rumen undegradable protein (RUP), microbial protein synthesis (MP), intestinal digestibility (ID) and apparent digestibility (CUD) of protein.

	Experimental diets			SIG[1]
	S0	**S1.5**	**S3**	
Intake N (g/day)	81.0	85.1	81.7	NS
Urine N (g/ day)	27.9	29.0	25.4	NS
Feces N (g/ day)	34.0	35.9	35.6	NS
Retained N (g/ day)	19.1	20.2	20.7	NS
Ruminal degradation parameters:				
a [2]	0.17[a]	0.11[ab]	0.02[b]	*
b [2]	0.81[a]	0.89[ab]	0.96[b]	*
c (h-1) [2]	0.055	0.062	0.083	NS
ED	0.51	0.49	0.50	NS
RUP	0.49	0.51	0.50	NS
MP (g/ day)	6.11[a]	5.40[ab]	3.69[b]	*
MP (g/kg DOM)	10.0	9.07	6.09	0.08
ID	0.78	0.74	0.74	NS
CUD	0.58	0.58	0.56	NS

[1] SIG – Significance, NS - not significant, * P < 0.05; means in the same row with different superscripts differ significantly (P<0.05);
[2] a- soluble or rapidly degradable fraction, b- slowly degraded fraction, c- degradation rate of the b fraction.

RESULTS

The addition of tannins:

- Induced a decrease in the soluble-nitrogen of the soybean meal
- Induced a decrease in the rapidly degradable fraction "a" of crude protein and an increase in the slowly degradable fraction "b"
- Did not change the effective degradability and rumen undegradable protein
- Induced a decrease in the microbial nitrogen yield
- Did not affect the intestinal digestibility
- Did not affect the apparent digestibility of DM, OM, NDF, ADF and CP
- Did not affect the rumen pH, NH3-N, and volatile fatty acid production.

MATERIAL AND METHODS

Addition of tannin extract to the soybean meal supplement – samples of soybean meal (6 kg) were sprayed with mixtures (1:9 w/v) of tannins extract diluted in acetone/water solution (70:30 v/v) in order to obtain soybean meal with 0 (S0), 1.5 (S1.5) and 3% (S3) of tannins.

Metabolic trial
Animals - three rumen cannulated Merino rams
Experimental design - 3 x 3 Latin square design
Feedstuffs – Basal diet -oat straw (600g) + manioc (300g) and Soybean meal (100 g) with tannin extracts (0, 1.5 or 3%).

Nutritive parameters
Apparent digestibility
Nitrogen balance
In situ degradability of protein (Ørskov and McDonald,1979)
Intestinal digestibility of protein (Calsamiglia and Stern ,1995)
Ruminal microbial protein synthesis (Chen and Gomes, 1992)
Ruminal pH and volatile fatty acids (Jouany,1981)

Portugal em Acção
MINISTÉRIO DA AGRICULTURA, DESENVOLVIMENTO RURAL E PESCAS

References
Calsamiglia S. and Stern M. D., 1995. J. Anim. Sci. 73: 1459-1465.
Ørskov E.R. and McDonald I., 1979. J. Agric. Sci. (Camb.) 92: 499-503.
Chen X.B. and Gomes M.J., 1992. Int. Feed Resources Unit, Rowett Res. Inst., Occasional Publ. 19p.

Acknowledgements: This work has received financial support from the project PRAXIS/CA/1982/1995.