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Growth performance of hair sheep at pasture, supplemented with tropical legume (*Mimosa caesalpiniifolia* Benth) rich in condensed tannins

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Abstract. Sansão do campo (*Mimosa caesalpiniifolia* Benth), a tropical legume with origin in the semi-arid region of Brazil containing approximately 12% condensed tannin (CT), was used to evaluate its effect on the performance of hair sheep at pasture. Eighteen lambs, with liveweight of 16.9 ± 1.87 kg, were divided in three treatments: control (C) (68% corn + 32% soybean meal), sansão do campo (S) (60% sansão do campo + 30% corn + 10% soybean meal) and sansão do campo with polyethylene-glycol 4000 (S+PEG) (S + 10 g PEG/animal/day). All sheep were kept together on a 1 hectare of *Panicum maximum* Jacq. cv. Tanzânia pasture. Each individual animal received 200 g/day of the supplement. CT content did not exceed 3% of dry matter (DM) in the diet. Pasture was collected and animals weighed fortnightly. Feed was analysed for DM, crude protein, neutral-detergent fiber, acid-detergent fiber, ether extract and ash. Concentrate analyses for group C (879, 214, 289, 49, 15 and 16 g/kg DM respectively) and S (876, 210, 532, 189, 24 and 15 g/kg DM respectively) as well as for forage (283, 89, 658, 388, 27 and 48 g/kg DM respectively) were available. After 105 days, group C lambs showed higher ($P < 0.05$) liveweight (27.4 kg), total gain (10.1 kg) and mean daily gain (96.5 g/day) compared with group S (22.7 kg, 6.0 kg and 56.8 g/animal/day respectively) and group S+PEG (23.8 kg, 7.0 kg and 66.8 g/animal/day, respectively). Although animals from group S+PEG showed higher values than S for the traits analyzed, the differences were not significant ($P > 0.05$). The best performance in the control group was due to the higher available energy level in this supplement. Although the CT in the sansão do campo had little effect on the performance of the sheep, further research would be necessary to know its effect over long periods of supplementation.

Keywords. Forage – Ovine – *Panicum maximum* – Supply.

Performances de croissance du mouton sur parcours et supplémenté avec une légumineuse tropicale (*Mimosa caesalpiniifolia *Benth) (sansão du champ) riche en tannins condensés

Résumé. Mimosa caesalpiniifolia *Benth est une légumineuse tropicale relativement riche en tannins condensés (environ 12%) originaire de la région semi-aride du Brésil et utilisée en alimentation animale. Dix-huit agneaux délainés de poids vif 16,9 ± 1,87 kg ont été répartis en trois groupes de 6 animaux chacun placés dans 1 ha de* Panicum maximum *Jacq. cv. Tanzania et recevant une supplémentation de 200 g/animal/jour de trois types de concentrés iso-protéiques. La teneur en tannins condensés du régime n'a pas dépassé 3% : contrôle (C) (68% maïs + 32% son de soja), sansão du champ (S) (60% sansão du champ + 30% maïs + 10% son de soja) et sansão avec polyéthylène-glycol (S+PEG) (S + 10 g PEG/animal/jour). L'échantillonnage de l'herbe et la pesée des animaux ont été réalisés tous les 14 jours. Les teneurs en matière sèche, matières azotées totales, NDF, ADF, extrait éthéré et cendres des aliments ont été, respectivement, de : 879, 214, 33, 15 et 16 g/kg MS, pour C, 876, 210, 129, 24 et 15 g/kg MS pour S, et 283, 89, 755, 375, 27 et 48 g/kg MS pour le fourrage. Après 105 jours les agneaux du groupe C avaient un poids vif de 27,4 kg, un gain de poids de 10,1 kg et une croissance journalière de 96,5 g. La meilleure performance enregistrée chez les ovins du groupe contrôle est le résultat d'une faible teneur en fibre du concentré. Bien que les tannins condensés du sansão du champ ne semblent pas affecter les performances des ovins, il est recommandé d'évaluer leurs effets pendant des périodes plus longues.*

Mots-clés. *Fourrage – Ovin* – Panicum maximum – *Supplémentation.*

I – Introduction

The use of legumes in ruminant feed has the advantage over grasses due to their protein level. Nevertheless the level of condensed tannins in these legumes may limit voluntary consumption or may be toxic to ruminants. The legume *Mimosa caesalpiniifolia* Benth, known as sansão do campo in the Brazilian Northeast, is widely used in hedges and remains green during the dry season. It has a condensed tannin (CT) level of approximately 12%. Condensed tannins may be beneficial in animal nutrition as protein for proteins against ruminal degradation and prevention of tympanism (Walton *et al.*, 2001). This experiment aimed to evaluate the effect of supplementation with sansão do campo on sheep kept at pasture.

II – Materials and methods

This experiment was carried out at the Sheep Research Center on the Água Limpa Farm of the University of Brasília. During 105 days, eighteen Santa Inês entire lambs, with live weight of 16.9 ± 1.87 kg, were divided in three treatments: control (C) (68% corn + 32% soybean meal), sansão do campo (S) (60% sansão do campo + 30% corn + 10% soybean meal) and sansão do campo with polyethylene-glycol 4000 (S+PEG) (S + 10 g PEG/animal/day). All sheep were kept together on a 1 hectare of *Panicum maximum* Jacq. cv. Tanzânia pasture. Each individual animal received 200 g/day of the concentrate and mineral salt *ad libitum*. CT content did not exceed 3% of dry matter (DM) in the diet. Animals weighed and pasture was collected fortnightly, simulating the feeding habits of the animals. Feed was analysed for DM, crude protein, ether extract and ash using Association of Official Agricultural Chemists (AOAC, 1995) procedures and neutral detergent fiber and acid detergent fiber according to Mertens (2002) (Table1).

Table 1. Chemical composition of diets fed lambs

Chemical composition (g/kg DM)	Grass	Concentrates	
		Control	Sansão
Dry matter	283	879	876
Crude protein	89	214	210
Condensed tannins†	0.2	0.2	47.66
Neutral-detergent fiber	658	289	532
Acid-detergent fiber	388	49	189
Ether extract	27	15	24
Ash	48	16	15

†Equivalent g leucocyanidin/kg DM.

The experimental design was fully randomized, with three treatments (different concentrates) and six repetitions. Liveweight was taken periodically and data analysed as measurements repeated in time using the PROC MIXED procedure of SAS (1999).

III – Results and discussion

Figure 1 shows the results for lamb growth over the experimental period. The beginning of the trial, no significant differences were found between treatments (Table 2). From day 15 the animals on the control treatment began to grow more rapidly, and this remained the case until the end of the experiment where they showed significantly higher live weight than animals on the other treatments (S and S+PEG; $P < 0.05$). Animals fed sansão do campo also gained weight over the experimental period and no significant differences were found between groups with or without PEG ($P > 0.05$).

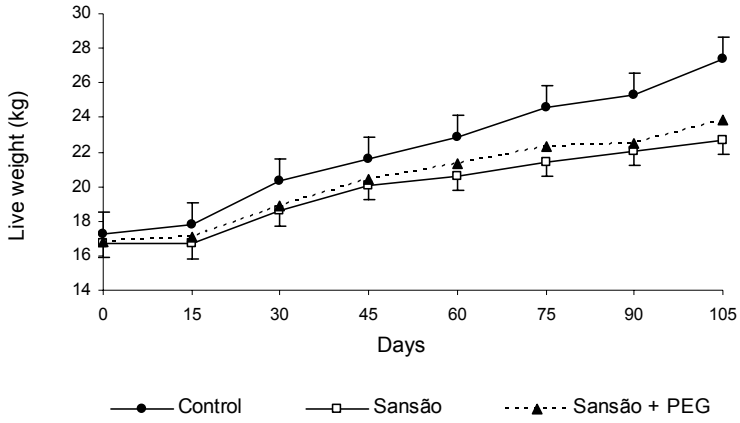

Fig. 1. Live weight mean and standard deviation of Santa Inê sheep fed the different concentrates.

Table 2. Mean and standard deviation of the initial live weight (LWi), final live weight (LWf), daily gain (DG) and accumulated gain (AG) in lambs receiving different concentrate

Variables	Treatments			SE
	Control	Sansão	Sansão + PEG	
LWi (kg)	17.27	16.73	16.80	2.96
LWf (kg)	27.38[a]	22.70[b]	23.82[b]	3.52
ADG (g/animal/day)	96.50[a]	56.83[b]	66.83[b]	21.17
AG (kg)	10.11[a]	5.97[b]	7.02[b]	2.08

[a,b]Different letters indicate significance (P ≤ 0.05) within rows.

As expected, similar results were found for daily gain and total gain over the experiment, with lambs in the control group growing faster than those in the Sansão groups and no differences being observed between these two groups.

As the three treatments were isoproteic (Table 2), it may be possible that the better performance of the control group was due to higher energy availability, as this had 68% of corn rich in starch while the Sansão concentrate had only 38%. As the animals were fed at pasture and no estimate of forage consumption was available, there was no indication that higher forage consumption caused the higher gain. Nevertheless this may have occurred and contributed to these results, as animals fed tannins may consume lower levels of feed (Miller *et al.*, 1995), due to the link of tannins with glycoprotein in the saliva, causing astringency in the mouth and with the intestinal mucosa, causing alterations. Tannin may also reduce enzymatic activity, nutrient permeability, lowering nutrient absorption by the intestine (Walton *et al.*, 2001) thereby reducing animal production.

Nevertheless, Aerts *et al.* (1999) showed that offering 4% to 6% tannin in the diet, the ruminant shows an increase in intestinal absorption of amino acids (methionine and cystine), wool production, ovulation rates, production and quantity of protein in milk, indicating that the level present in the diet determines the beneficial or toxic effects. As in the present study the level of CT was 3% and PEG is able to strongly bond with the tannins (Getachew *et al.*, 2000) neutralizing it.

Live weight gain of animals fed PEG was similar to those without PEG, showing that the CT present in the diet was not responsible for the lower performance, in agreement with the hypothesis that the higher available energy in the control group led to better performance in these animals compared to those fed with sansão do campo.

IV – Conclusion

Sansão do campo (*Mimosa caesalpiniifolia* Benth) showed potential for use in animal nutrition, but more studies are needed over longer periods to ensure safety use in sheep and maintenance of production levels.

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References

Aerts R.J., Barry T.N. and McNabb W.C., 1999. Polyphenols and agriculture: Beneficial effects of proanthocyanidins in forages. In: *Agriculture Ecosystem and Environment*, 75. p. 1-12.

AOAC (Association of Official Agricultural Chemists), 1995. *Official Methods of Analysis of AOAC*, 16 edn. Arlington, VA, USA: AOAC International.

Getachew G., Makkar H.P.S. and Becker K., 2000. Effect of polyethylene glycol on *in vitro* degradability of nitrogen and microbial protein synthesis from tannin-rich browse and herbaceous legumes. In: *Br. J. Nutr.*, 84. p. 73-83.

Mertens D.R., 2002. Gravimetric determination of amylase-treated neutral detergent fibre in feeds with refluxing beakers or crucibles: Collaborative study. In: *Journal of AOAC International*, 85(6). p. 1217-1240.

Miller S., McDonald P.M., Brooker J.D. and Martin P., 1995. Feral goat fluid increases nitrogen retention in sheep consuming a mulga (*Acacia aneura*) diet. In: *Aust. J. Agric. Res*., 46. p. 1545-1554.

SAS (Statistical Analysis System Institute), 1999. *SAS System for Linear Models*. Cary, NC, USA: SAS Institute Inc. 211 p.

Walton J.P., Waghorn G.C., Plaizier J.C., Birtles M. and McBride B.W., 2001. Influence of condensed tannins on gut morphology in sheep fed *Lotus pedunculatus*. In: *Can. J. Anim. Sci.*, 81. p. 605-607.