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CONSTRUINDO SABERES, FORMANDO PESSOAS E TRANSFORMANDO A PRODUÇÃO ANIMAL

BLOOD PARAMETERS OF SHEEP FED WITH DIETS CONTAINING AMAZON CO-PRODUCTS

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Abstract: O objetivo foi avaliar parâmetros sanguíneos de ovinos alimentados com dietas contendo coprodutos da Amazônia. Vinte e oito ovinos foram distribuídos em gaiolas metabólicas individuais, em delineamento em blocos ao acaso, onde os blocos foram definidos pelos pesos dos animais; quatro tratamentos, sete repetições e dois períodos de coleta. As dietas experimentais foram formuladas para conterem 7% de extrato etéreo em matéria seca (MS) e serem isonitrogenadas. Foram fornecidas diariamente, às 08:00 h e às 17:00 h. Os pesos das dietas ofertadas e das sobras foram registrados para estimar o consumo de matéria seca (DMI), com ajustes diários das sobras em 20% (matéria fresca). Cada animal recebeu silagem de milho e um dos seguintes concentrados: reduzido teor de óleo (ROC), contendo torta de cupuaçú (CUP), contendo torta de tucumã (TUC) e elevado teor de óleo (HIOC). As amostras de sangue foram coletadas nos 34º, 47º e 60º dias, utilizando tubos vacutainer com anticoagulante (EDTA). Ovinos alimentados com dietas contendo cupuaçú e tucumã apresentaram aumentos nas concentrações plasmáticas de colesterol total, triglicérides e HDL (P<0,05); entretanto, as dietas não afetaram as concentrações de glicose, proteína ou albumina (P>0,05). Não houve efeito do período de coleta sobre os parâmetros sanguíneos (P>0,05).

Keywords: Hematology, lipids, nutrition, sheep

Introduction

Brazilian sheep herds, in 2016, contained 18.4 million head (EMBRAPA, 2017). Among the production sectors, the meat industry has been the main objective of sheep production in the national market. However, to meet and maintain the supply of quality meat products, it is necessary to use nutritional strategies that attend producer reality.

Ingredients such as soybean meal and corn, included in most of the ruminant's diets, although nutritionally interesting, raise the cost of production and compromise the economic income at the end of the chain. To partially replace and reduce feed costs, studies have been carried out in the field of animal nutrition evaluating the use of regional co-products as possible alternatives.

In the Amazon region, almonds from the fruits of cupuaçú (*Theobroma grandiflorum*) and Tucumã (*Astrocaryum aculeatum*) are submitted mechanical oil extraction. With reduced oil content, almonds are considered residues and become an agroindustry problem, but with potential use to ruminant nutrition.

However, cupuaçú and tucumã residues' effect on sheep blood parameters, considering the variables glucose, albumin, cholesterol, HDL and total proteins still are unknown. These parameters could be able to guide the understanding of the basic biochemical processes of sheep.

Therefore, the objective was to evaluate blood parameters of sheep fed with diets containing Amazon co-products.

Materials and Methods

The protocol used in this experiment was approved by the Ethics Committee on Animal Use, Federal University of Pará, Faculty of Veterinary Medicine/Campus Castanhal (protocol number 8694141217).

Twenty-eight castrated lambs of crossbreeding, Dorper x Santa Inês, with an average body weight of 35 ± 2 kg and 9 ± 2 months were used. They were housed in metabolic 0,75 m², equipped with trough and waterer. Experimental diets were formulated to contain 7% ethereal extract in dry matter (DM) and to be isonitrogenous. The roughage feed was maize silage (400 g/kg on a DM basis) plus concentrate (600 g/kg on a DM basis). Experimental diets were formulated to meet the requirements of weaned lambs recommended by NRC (2007) for an average weight gain of 250 g day^{-1}. Diets were supplied daily at 0800 h and 1700 h, to allow 20% as leftovers (fresh

matter); the weights of feed supplied, and leftovers were recorded to estimate the dry matter intake (DMI). At the onset of the experiment, lambs were identified, dewormed, vaccinated against clostridioses and distributed at random into the following treatments: reduced oil content (ROC), containing cupuaçu pie (CUP), containing tucumã pie (TUC) and high oil content (HIOC). The proportion of the ingredients in the experimental diets are presented in Table 1. The experimental period lasted 50 days; the first 14 days were for adaptation to the facilities and diet and the last 36 days were data collection defined as two experimental periods, with 18 d in each one.

The blood samples were collected on the 34th, 47th and 60th days at 1400 h, using the same collection sequence, by a puncture in the jugular vein, using anticoagulant (EDTA) vacutainer tubes. Immediately, they were centrifuged at 5.000 rpm for 15 min for plasma removal, stored in eppendorfs and frozen at -15°C. The frozen samples were sent to the Physiology and Animal Reproduction Laboratory of Universidade Federal of Viçosa to analyze the blood parameters. Glucose, cholesterol, triglycerides, HDL, albumin and total plasma proteins were determined by the automated biochemical analyzer (Mindray BS-200E, China) using commercial kits. Blood parameter data were submitted to analysis of variance considering the effect of treatments and periods. The means were compared using a T-test at 5% significance.

Table 1. Composition of the experimental diets (%)

Ingredient	Diets			
	ROC	CUP	TUC	HIOC
Corn silage	40.0	40.0	40.0	40.0
Ground corn	43.2	6.2	13.2	40.7
Soybean meal	14.8	6.8	13.9	1.3
Ground soybean	-	-	-	14.5
Soybean oil	-	-	-	1.5
Cupuaçú pie	-	45.0	-	-
Tucumã pie	-	-	30.9	-
Mineral and vitamin supplement[1]	1.5	1.5	1.5	1.5
Limenstone	0.5	0.5	0.5	0.5

[1]calcium, 140 g; phosphorus, 65 g; magnesium, 10 g; sulfur, 12 g; sodium, 130 g; cobalt, 80 mg; iron, 1000 mg; iodine, 60 mg; manganese, 3.000 mg; selenium, 10 mg; zinc, 5.000 mg; fluorine (maximum), 650 mg; vitamin A, 50.000 U.I.; vitamin E, 312 U.I.

Results and Discussion

Sheep fed with diets containing cupuaçú and tucumã pies had increases in total cholesterol, triglycerides, and HDL plasma concentrations (P<0.05); however, the diets did not affect glucose, protein or albumin concentrations (P> 0.05). There was no collection period effect on blood parameters (P>0.05) (Table 2).

Glucose values are within the reference values for sheep (50 a 80 mg/dL) (Pugh, 2004). Linoleic acid (n-6) is associated with an increase in total cholesterol levels. A diet supplemented with fat increases plasma and follicular levels of HDL-cholesterol (GhoreishI et al., 2007), which was found in this experiment, except in the animals fed with ROC diet, which had a lower cholesterol content (57.65 mg/dl) and HDL (37.0), differing statistically (P<0.05) from the other treatments.

Table 2. Blood parameters of sheep fed with experimental diets

Parameter (mg/dL)	Diets				P-value	
	ROC	CUP	TUC	HIOC	Treatment	Period
Glucose	63,8	62,0	59,6	66,7	0.1693	0.1181
Total cholesterol	57,6b	70,3ª	75,5a	77,5ª	0.0047	0.6298
Triglycerides	11,0c	26,3ª	20,5b	18,5b	0.0000	0.5040
HDL	37,0b	48,1ª	52,5a	51,4ª	0.0004	0.4168
Protein	5,6	5,5	5,7	5,4	0.1694	0.2318
Albumin	3,2	3,15	3,15	3,2	0.7781	0.5927

Means followed by the same letters on the lines do not differ significantly by the Tukey test (P<0.05). High-density lipoprotein (HDL).

Sheep fed with CUP diets had higher triglyceride concentration in plasma (26.34 mg/dL). This value is higher than the reference value of 17.6 and 24.0 mg/dL (Ghoreishi et al., 2007). Fat in the diet improves food efficiency since there is more metabolizable energy in the lipids compared to carbohydrates or proteins (Zachut et al., 2008).

The detection of total proteins in the blood parameters allows evaluation of the animal's nutritional status, as their decrease in plasma is related to the protein deficiency in the diet. The protein reference values for sheep are between 674 mg/dL and 710 mg/dL (Pugh, 2004); however, plasma protein concentrations found in all experimental animals are lower than the recommended values, indicating that diets tested provided low protein intake for animals' metabolism.

Conclusion

Sheep fed with diets containing cupuaçú and tucumã pies had increases in total cholesterol, triglyceride and HDL concentration in plasma.

Reference

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