Productive Performance of Feedlot Sheep Fed Cassava Peel Silage with or Without Palm Kernel Cake Replacing Ground Corn

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Introduction

Brazil has a wide diversity of foods destined for agro-industries, among which cassava and palm oil stand out, being the fourth largest producer of cassava (CONAB, 2023) and the majority of palm oil production is concentrated in the North and Northeast regions of the country (COSTA et al., 2011). As a result of agro-industrial processing, by-products of these foods are generated and can be used to feed ruminants, which play an important role in the bioeconomy, in which they convert foods that are inedible for humans (forage, agricultural by-products, crop residues) into high-value food (meat and milk) (OLIVEIRA et al., 2014). Cassava peel and palm kernel cake are unconventional foods from the agroindustry that present viable nutritional values for feeding ruminants, being used as a source of energy in animal feed (SANTOS et al.,2019). However, cassava peel may contain certain levels of hydrogen cyanide (HCN), which are compounds that are harmful to animals. Strategies such as fermentation are used to reduce these levels (PITIRINI, 2023).

The goal of this experiment was to evaluate the performance of feedlot sheep fed diets with cassava peel silage and cassava peel silage with palm kernel cake replacing the energy in the diet concentrate.

Materials and methods

The experiment was conducted in the experimental area at the Igarapé-Açu School Farm of the Federal Rural University of the Amazon (UFRA), located in the municipality of Igarapé-Açu, in the state of Pará, Brazil, 01°07'21" S e 47°36'27" W. Thirty crossbred sheep, male and female, with a predominance of Santa Inês breed, healthy and dewormed (Albendazol10% - Oral solution; 5 mg/kg live weight), with an average initial weight of 18 kg were used and distributed through a randomized block design, using the sex of the animals as a blocking factor, with two blocks and three treatments and five repetitions, totaling thirty experimental units. The experimental diets were formulated to be isoproteic, meeting the nutrient requirements for lambs with an average daily weight gain of 200g, according to Nutrients Requirements of Small ruminant's recommendations (2007). In this way, the diets were the replacement of the source of energy ingredient in the concentrate. Diet 1 was composed of guinea grass silage, ground corn and soybean meal. Diet 2 and diet 3 were composed of cassava peel silage and cassava peel silage + 30% of palm kernel cake, respectively, replacing ground corn. The chemical analysis of the ingredients was carried out in the animal nutrition laboratory of the Federal Rural University of the Amazon.

The feedlot evaluation lasted 97 days, with 20 days for adaptation and 67 days for collecting data for intake, feed conversion and weight gain. All variables were analyzed using the GLM procedure in the Statistical Analysis System (SAS). The means were compared by the Tukey test, considering $\alpha = 0.05$.

Table 1 - Chemical composition of ingredients and experimental diets

Items	Dry matter	Organic matter	Crude protein	Ether extract	NDF	ADF	non-fibrous carbohydrates
	(%)		% DM				
Guinea grass silage	37.88	93.27	3.48	1.13	76.12	47.56	12.54
Ground corn	92.57	98.62	7.26	4.89	17.29	3.95	69.18
CPS	38.65	94.76	4.68	1.28	20.74	14.11	68.06
CPS+ PKC	51.09	83.52	5.10	4.38	49.49	31.10	24.55
Soybean meal	93.56	93.39	41.71	7.52	22.06	13.02	22.10
Diet 1	69.65	93.41	15.71	7.01	42.88	21.04	32.74
Diet 2	53.94	92.44	15.08	5.39	31.90	22.30	43.91
Diet 3	60.06	87.03	15.69	8.20	48.05	27.99	20.32

CPS= cassava peel silage; PKC = palm kernel cake

Results

Initial live weight and DM intake expressed as % LW were not affected by the diets ($P>0.05$; Table 2). The performance parameters, DM intake (kg/day) and the feed efficiency were affected by the diets ($P<0.05$) in the same way. Diets containing CPS showed similar values of the diet containing GC, and both CPS and GC showed higher values compared with the diet containing CPS+PKC.

Table 2 - Average values of initial weight, final weight, total weight gain, daily weight gain, dry matter intake and feed efficiency of feedlot sheep.

Items	Initial live weight	Final live weight	Total weight gain	Daily weight gain	Dry matter intake		Feed efficiency
	----------kg----------			kg/day	kg/day	%LW	kg gain/KgDM
Ground corn	19.11a	31.09a	11.98a	0.179a	0.901a	3.59a	0.201a
CPS	18.40a	30.34a	11.94a	0.178a	0.911a	3.75a	0.196a
CPS+PKC	18.50a	25.27b	6.77b	0.101b	0.765b	3.53a	0.133b
SE	0.53	0.73	0.54	0.00	0.02	0.05	0.00
P-value							
Diet	0.67	<0.01	<0.01	<0.01	<0.01	0.23	<0.01

CPS= cassava peel silage; PKC = palm kernel cake

The low intake and performance of CPS+PKC diet relies on its high NDF concentration due to the inclusion of palm cake in cassava peel silage, which increases the dry matter and fiber content in the silage (PITIRINI, 2023). A diet with high NDF can decrease DM intake. The high proportion of fiber influences consumption, due to the peculiar characteristics of the digestive tract of ruminants, which include long periods of food retention and a large storage capacity in the rumen (VISONA-OLIVEIRA et al., 2015). In addition, other factors can affect silage intake, as the product quality and animal's preference.

The results show that cassava peel silage can replace ground corn in concentrate diets for ruminants without altering the productive performance of the animals. In their study, supplementing sheep with fresh, dried and ensiled cassava peel, Niayale et al (2020) shows that the use of cassava peel silage provides better results in animal performance. Cassava peel has a high potential for total replacement of corn as it has similar energy values (SANTOS et al., 2015).

Conclusions

Cassava peel silage can be used to replace ground corn concentrate in animal diets for sheep as it does not alter the animal's productive performance characteristics and bcan optimize the production costs of small ruminants. The addition of palm kernel cake to cassava peel silage did not show effective results in the productive performance of sheep, as high fiber values in diets can influence the animal's feed intake.

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