Revista Brasileira de Zootecnia
Brazilian Journal of Animal Science
© 2017 Sociedade Brasileira de Zootecnia
ISSN 1806-9290
www.sbz.org.br

R. Bras. Zootec., 46(8):657-663, 2017

Proportions of sugarcane and babassu mesocarp bran in diets for feedlot cattle

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ABSTRACT - The objective of this study was to evaluate the production performance of feedlot cattle fed diets containing chopped sugarcane ratios (580 or 380 g/kg of diet dry matter) as roughage and levels of inclusion of babassu mesocarp bran (BMB; 420 to 620 g/kg of concentrate dry matter). Twenty-four young Nellore bulls with 321±23 kg initial body weight, at 22 months of age, were used in a completely randomized experimental design with treatments in a 2 × 2 factorial arrangement and six replicates. Dry matter intake (21.71 g/kg of body weight), average daily gain (1.46 kg/day), and cold carcass weight (232.59 kg) were not changed by proportion of sugarcane or BMB level. The proportions of sugarcane and BMB levels did not change the apparent digestibility of the diets, except the digestibility of neutral detergent fiber, which was lower in the diet associating the lowest levels of sugarcane and BMB. Increasing proportions of sugarcane reduced subcutaneous fat thickness from 2.89 to 1.91 mm. Carcass commercial primal cuts were not affected by variation factors. Inclusion of babassu mesocarp bran enables the use of larger proportions of sugarcane as a result of the increased digestibility of the fiber fraction of feedlot cattle diets without changing the performance and main carcass traits of these animals.

Key Words: carcass primal cuts, carcass weight, digestibility, dry matter intake, weight gain

Introduction

Babassu mesocarp bran (BMB) is an important byproduct originating from the processing of the coconut of babassu, a natural palm tree in the Brazilian tropical region and Central America. Babassu has gained international prominence for its potential for biodiesel production, particularly because babassu forests produce 10.7 billion tons of fruit per year (Teixeira and Carvalho, 2007; Teixeira, 2008). The babassu coconut is used to generate several products for human consumption, such as flour, oil (from which biodiesel is obtained), and bran, used in animal feeding. The babassu mesocarp bran is produced from its mesocarp (23% of the fruit) and has a great regional supply at a low cost, which has promoted its use in animal feeding (Silva et al., 2012).

Nutritionally, the babassu mesocarp bran is characterized as fibrous feed with high energy content, but with reduced particle size, which determines the high passage rate through the digestive tract of ruminants. Research carried out with this byproduct in ruminant has focused mainly on inclusion levels replacing corn grain in diets (Miotto et al., 2012; Silva et al., 2012) and recently evolved to the assessment of this feed replacing corn in diets with different levels of concentrate (Cruz et al., 2014) and/or associated with the processing of corn grain (Santana et al., 2015). Recently, because of the good results when used in moderate dietary inclusion levels, this byproduct has been evaluated in association with other feedstuffs, e.g., pearl millet (Alencar et al., 2015). Overall, results from these studies have shown that, at moderate levels in diets, BMB provides similar animal performance and carcass traits in relation to corn, lowering the feed cost (Cruz et al., 2014, 2015; Alencar et al., 2016).

In this scenario, sugarcane is of great use in tropical regions of Brazil and is characterized by a high indigestible fiber content and a low passage rate (Magalhães et al., 2006), contrasting with the BMB characteristics (small particle size and high passage rate) (Miotto et al., 2013).

Received: July 7, 2016
Accepted: February 13, 2017
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http://dx.doi.org/10.1590/S1806-92902017000800005

How to cite: Augusto, W. F.; Ribeiro, G. M.; Restle, J.; Missio, R. L.; Neiva, J. N. M.; Miotto, F. R. C. and Rocha, H. P. S. L. 2017. Proportions of sugarcane and babassu mesocarp bran in diets for feedlot cattle. Revista Brasileira de Zootecnia 46(8):657-663.

Thus, the animal response to BMB inclusion in diets with a higher sugarcane content can be improved by increasing the fiber digestibility, increasing the rumen retention of smaller BMB particles. At the same time, the high passage rate of BMB can compensate for the low passage rate of sugarcane, increasing dry matter intake and the performance of animals on sugarcane-based diets. As such, BMB may totally or partially overcome the main limitation of the use of sugarcane in beef cattle diets, which is the reduced intake (Pires et al., 2010a).

The objective of this study was to evaluate the performance of feedlot cattle fed diets containing proportions of fresh sugarcane as the only roughage and BMB inclusion levels in the concentrate.

Material and Methods

The experiment was conducted from July to October 2011, in Araguaína, TO, Brazil (07º11'28" S and 48º12'26" W). Procedures performed in this experiment were approved by the local Ethics Committee for Animal Experimentation (case no. 23101001307/2013-18).

Twenty-four young Nellore bulls, at 22 months of age, with an initial average body weight of 321±23 kg, were kept in individual concrete floor stalls (12 m^2) equipped with feed and water troughs. At the beginning of the adaptation phase (14 days), all animals were dewormed and supplemented with vitamins A, D, and E.

Four diets were formulated to meet the requirements for growth and finishing (1.20 kg/day) of young Nellore bulls according to Valadares Filho et al. (2010). These diets included chopped sugarcane as forage and concentrates composed mainly of corn grain, babassu mesocarp bran (BMB), and soybean meal (Table 1). Sugarcane was harvested with 12 months of regrowth and shredded to obtain a particle size of 8-10 mm. The babassu mesocarp bran was obtained commercially by grinding the mesocarp of babassu fruit until 96% of particles were smaller than 1.18 mm in diameter (Penn State Particle Size Separator). Treatments were distributed in a factorial arrangement involving two proportions of sugarcane (high or low) and two BMB inclusion levels (Table 2).

Animal performance was measured for 98 days, which consisted of 14 days of adaptation to diet and stalls and 84 days of data collection. Animals were fed at 09.00 and 16.00 h *ad libitum* and the amount supplied was adjusted to allow for 10% as orts (dry matter (DM) basis). Animals fasting for 14-16 h were weighed at the beginning and end of the evaluation period. To obtain the average feed intake, feed and orts were weighed daily. Throughout the performance test, samples of ingredients and orts from each animal and ingredients of feed concentrates from mixture preparations were collected weekly to form representative samples.

Feces for the digestibility trial were collected during the last three days of the experimental period. Feces were collected (300 g) manually after spontaneous defecation and before the fecal bolus reached the floor of the pen, with animals monitored from 06.00 h until the collection of the sample from the last animal. For the digestibility trial and analysis of nutrients, samples were pre-dried in a forced-air oven at 55 °C for 72 h and ground through a 1-mm sieve. From the three ground samples, a composite sample was made and stored in plastic containers for subsequent laboratory analyses. The fecal dry matter excretion was estimated using indigestible neutral detergent fiber (iNDF), according to the methodology of Cochran et al. (1986). The iNDF contents of the samples of feces, feed (roughage and ingredients of the concentrate), and orts were obtained after *in situ* rumen incubation for 240 h (Casali et al., 2008). The fecal output (kg of DM/day) was calculated as follows: iNDF intake/iNDF in feces. Digestibility was calculated by the following expression: apparent digestibility of nutrients = [(nutrient intake − nutrients excreted)/nutrient intake].

Table 1 - Chemical composition of ingredients (g/kg of dry matter)

Nutrient	Ingredient			
	Sugarcane	Corn	Soybean	BMB
Dry matter (g/kg as fed)	256.50	877.80	884.80	880.50
Ash	35.00	26.20	73.10	61.90
Crude protein	30.80	91.00	487.60	37.30
Ether extract	12.70	41.80	17.50	14.10
Neutral detergent fiber	557.20	143.90	153.70	461.40
Total carbohydrates	925.70	845.80	431.20	886.70
Non-fibrous carbohydrates	363.00	686.40	287.50	432.30

BMB - babassu mesocarp bran.

Table 2 - Proportion of ingredients in the diets (g/kg of dry matter)

Item	High sugarcane[1]		Low sugarcane[2]	
	420-BMB	620-BMB	420-BMB	620-BMB
Fresh sugarcane	580.00	580.00	380.00	380.00
Ground corn	115.10	74.30	245.70	158.20
Soybean meal	206.70	212.70	182.80	196.50
BMB	77.00	111.80	164.30	238.10
Mineral mixture[3]	12.70	12.70	18.80	18.80
Urea	8.50	8.50	8.40	8.40

BMB - babassu mesocarp bran.

[1] High sugarcane: 580 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).

[2] Low sugarcane: 380 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).

[3] Composition: P, 40 g; Ca, 146 g; Na, 56 g; S, 40 g; Mg, 20 g; Cu, 350 mg; Zn, 1,300 mg; Mn, 900 mg; Fe, 1,050 mg; Co, 10 mg; I, 24 mg; Se, 10 mg; F (maximum), 400 mg; excipient q.s., 1,000 mg.

Standard procedures of AOAC (1990) were adopted to obtain the following components from the feed, orts, and fecal samples: dry matter, mineral matter (MM), crude protein (CP), and ether extract (EE). Neutral detergent fiber (NDF) was determined according to Van Soest et al. (1991). Total carbohydrates (TC), non-fibrous carbohydrates (NFC), and total digestible nutrients (TDN) were estimated according to Sniffen et al. (1992), as follows: TC = 1000 − (CP + EE + MM); NFC = 1000 − (TC − NDF); and TDN = digestible CP + (digestible EE × 2.25) + digestible NDF + digestible TC. The metabolizable energy (ME) of the diets was estimated considering 1 kg TDN = 4.4 Mcal digestible energy and 1 Mcal of digestible energy = 0.82 Mcal of ME (Table 3).

At the end of the feedlot period, animals were slaughtered at a commercial slaughterhouse under supervision of the Federal Inspection Service. Prior to the slaughter, animals were fasted for 14-16 h. The carcasses were identified, divided in half, and weighed. After the carcasses were washed and kept in a cold chamber for 24 h at a temperature varying between 0 and 2 °C, they were weighed again. The right half carcass was sectioned between the 11th and 12th ribs, exposing the *longissimus dorsi* muscle, in which the subcutaneous fat thickness was determined. The left half of the carcass was separated into primal cuts, with the forequarter separated from the pistol cut and short ribs between the 5th and 6th ribs, including neck, shoulder, arm, and five ribs. Through the rib cut at 22 cm from the spine, the pistol cut was separated from the short ribs, including the ones from the sixth ribs onwards, plus the abdominal muscles.

The experimental design was completely randomized, with treatments distributed in a 2 × 2 factorial arrangement, with six replicates. Data were subjected to analysis of variance by the mixed-model methodology (Littell et al., 2006), in which the model included the fixed effect of treatment and random effects of animal. Means were compared by Tukey's test ($\alpha = 0.05$). Statistical procedures were carried out using SAS software (Statistical Analysis System, version 9.1). The general mathematical model was represented by:

$$Y_{ijk} = \mu + T_i + M_j + T_i \times M_j + \beta_1 X_{ij} + e_{ijk},$$

in which μ is a constant, T_i is the effect of the sugarcane proportion, M_j is the effect of the BMB level, $T_i \times M_j$ is the effect of the interaction between the factors of variation, $\beta_1 X_{ij}$ is the effect of the covariate (initial body weight), and e_{ijk} is the residual random error. When not significant, the effect of the covariate was withdrawn from the model.

Results

There was no interaction (P>0.05) between the proportion of sugarcane in the diet and level of inclusion of BMB in the concentrate on the evaluated variables, except for apparent digestibility of NDF. The intakes of DM, EE, and TDN were not affected by the treatments (Table 4). Crude protein intake was only changed by the proportion of sugarcane in the diet, with higher values found in animals on the treatments with a higher proportion of this roughage. Neutral detergent fiber intake (kg/day), on the other hand, was changed only by the level of BMB, with higher values detected for the diets with higher proportion of this byproduct. Neutral detergent fiber intake in g/kg body weight varied depending on the variation factors; lower values were found with the diet that associated the lowest proportions of sugarcane and BMB.

Average daily gain and final body weight were not changed (P>0.05) by the proportion of sugarcane in the diet or level of BMB inclusion in the concentrate (Table 5). Feed conversion, likewise, was not altered by the proportion of sugarcane of the diet or BMB level in the concentrate. Carcass characteristics were not affected by the variation factors, except for subcutaneous fat thickness, which was higher in the diets with the lower roughage level.

Table 3 - Chemical composition of the diets (g/kg of dry matter)

Item	High sugarcane[1]		Low sugarcane[2]	
	420-BMB	620-BMB	420-BMB	620-BMB
Dry matter (DM) (g/kg as fed)	526.90	525.2	654.90	652.40
Mineral matter	55.90	57.00	57.30	62.40
Crude protein	153.10	154.00	151.50	153.90
Ether extract	14.40	13.70	14.00	15.30
Neutral detergent fiber	413.40	428.10	351.70	389.70
Total carbohydrates	784.30	782.80	782.80	774.00
Non-fibrous carbohydrates	381.10	367.30	445.20	403.00
Total digestible nutrients	588.00	572.00	595.00	589.00
Metabolizable energy (Mcal/kg of DM)	2.12	2.06	2.15	2.13

BMB - babassu mesocarp bran.
[1] High sugarcane: 580 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).
[2] Low sugarcane: 380 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).

Discussion

The high passage rate of BMB has been reported as the main cause of the increase in DM intake in diets that include this byproduct (Miotto et al., 2013). In this study, the lack of variations in DM intake with inclusion of BMB might be associated with the inclusion levels of this byproduct that ranged from 7.7 to 11.18% and from 16.43 to 23.81% in the diets with high and low proportions of sugarcane, respectively. Changes in DM intake with the inclusion of BMB in the cattle diets were found when the levels of this byproduct reached values higher than 25% of the diet dry matter (Cruz et al., 2014; Alencar et al., 2015). The high indigestible fiber content and low passage rate of sugarcane may have contributed to the obtained results, altering the transit of BMB through the reticulorumen (reducing its output) due to fiber entanglement.

The similar DM intake for the proportions of sugarcane in the diets might be associated, in part, with the small particle size and high passage rate of BMB (Miotto et al., 2013), which possibly compensated for the lower passage rate of diets with the higher proportion of sugarcane. In general, cattle fed greater proportions of sugarcane have a lower DM intake, which reflects in the rumen fill caused by high indigestible fiber content and lower passage rate of feeds (Magalhães et al., 2006; Pires et al., 2010b). However,

Table 4 - Intake and apparent digestibility of nutrients according to variation factors

Item	High sugarcane[1]		Low sugarcane[2]		CV (%)	P-value		
	420-BMB	620-BMB	420-BMB	620-BMB		Sugarcane (S)	BMB	S × BMB
				Intake (kg/day)				
Dry matter	7.82	8.48	8.63	8.30	12.09	0.449	0.690	0.241
Crude protein	1.90	2.00	1.75	1.70	12.88	0.026	0.616	0.391
Ether extract	0.08	0.08	0.08	0.09	13.03	0.184	0.258	0.631
Neutral detergent fiber	3.13	3.55	3.07	3.27	11.72	0.278	0.046	0.497
Total digestible nutrients	4.80	5.02	5.13	4.86	11.36	0.743	0.982	0.323
				Intake (g/kg body weight)				
Dry matter	20.39	22.27	22.64	21.53	12.09	0.449	0.690	0.241
Neutral detergent fiber	8.16	9.32	8.05	8.48	10.50	0.214	0.036	0.412
				Apparent digestibility (g/kg dry matter)				
Dry matter	606.90	576.00	586.10	582.60	3.90	0.456	0.084	0.159
Neutral detergent fiber	265.30	231.20	174.60	259.80	7.46	<0.001	<0.001	<0.001

BMB - babassu mesocarp bran; CV - coefficient of variation.
[1] High sugarcane: 580 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).
[2] Low sugarcane: 380 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).

Table 5 - Performance and carcass characteristic according to variation factors

Item	High sugarcane[1]		Low sugarcane[2]		CV (%)	P-value		
	420-BMB	620-BMB	420-BMB	620-BMB		Sugarcane (S)	BMB	S × BMB
				Animal performance				
IBW	320.75	322.00	319.75	322.08	-	-	-	-
FBW	446.33	439.53	442.42	448.96	4.43	0.735	0.987	0.417
ADG	1.49	1.41	1.44	1.52	16.00	0.728	0.958	0.423
FC	5.28	6.16	6.02	5.52	12.51	0.863	0.514	0.302
				Carcass characteristics				
HCW	244.45	237.64	248.12	246.27	4.83	0.217	0.380	0.613
CCW	232.17	227.36	235.90	234.92	4.60	0.211	0.515	0.666
HCY	0.457	0.541	0.561	0.548	2.66	0.091	0.128	0.643
CCY	0.520	0.518	0.533	0.523	2.63	0.107	0.286	0.514
DL	0.028	0.025	0.031	0.028	26.76	0.355	0.288	0.954
FT	2.03	1.79	3.00	2.79	33.82	0.008	0.967	0.494
F	0.399	0.409	0.407	0.408	2.45	0.389	0.204	0.207
SR	0.108	0.102	0.107	0.108	6.06	0.378	0.284	0.266
PC	0.492	0.486	0.485	0.485	1.70	0.112	0.564	0.593

BMB - babassu mesocarp bran; IBW - initial body weight (kg); FBW - final body weight (kg); ADG - average daily gain (kg/day); FC - feed conversion (kg dry matter/kg weight gain); HCW - hot carcass weight (kg); CCW - cold carcass weight; HCY - hot carcass yield (kg/kg); CCY - cold carcass yield; DL - drip loss (g/kg); FT - fat thickness (mm); F - forequarter (kg/kg); SR - short ribs (kg/kg); PC - pistol cut (kg/kg); CV - coefficient of variation.
[1] High sugarcane: 580 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).
[2] Low sugarcane: 380 g kg^{-1} of sugarcane in the diets with 420 or 620 g kg^{-1} of BMB in the concentrate (dry matter basis).

according to Restle et al. (2012), when the roughage is of medium to low quality, but the energy level of the diets is not a limiting factor, DM intake tends to remain constant with the concentrate increase, which makes the results consistent.

The higher crude protein intake obtained with the diets with the higher proportion of sugarcane can be attributed to animal selectivity. Thus, in trying to maintain energy intake due to the increased roughage in the diets, the animals selected the more digestible feed fractions with higher energy contents and also the fractions with more protein (concentrated fraction). This hypothesis can be confirmed by the lower (32.40%) crude protein content in the leftovers of animals fed diets with a higher proportion of sugarcane. Similarly, Suzuki et al. (2014) found an increased amount of large sugarcane particles in leftovers from non-lactating cows as the proportion (0, 3, 5, 10, 15, and 20%) of this roughage replacing ryegrass silage was increased. Feed selectivity of the animal, on the other hand, may also have contributed to the similar feed intakes, as the intake of more digestible feed fractions may have benefited the passage rate in diets with the higher proportion of sugarcane.

The similar EE intake between the diets can be explained mainly by the similar DM intake. In addition, low levels of inclusion of BMB, which has a low EE content (Table 1), may have contributed to these results, as the diets with high levels of this byproduct showed no significant reduction of lipid fraction (Table 3). Miotto et al. (2013) and Santana et al. (2015), however, found that EE intake decreased when they replaced up to 100% and 42.24 % of corn grain, respectively, by BMB, reflecting the reduction in DM intake and the lower EE content of BMB in relation to corn. For the use of sugarcane, on the other hand, the literature has shown, with a high frequency, that an increase in the proportion of sugarcane in cattle diet reduces EE intake as a result of the reduction of DM intake (Magalhães et al., 2004, 2006).

The higher NDF intake with BMB inclusion in the diet can be attributed to the high fiber content of the feed, which was consistent with results reported in the literature (Miotto et al., 2013; Cruz et al., 2014; Santana et al., 2015). However, the literature shows that, in general, an increase in the proportion of sugarcane in cattle diets reduces NDF intake due to the decrease in DM intake (Magalhães et al., 2004, 2006). It is noteworthy that, in all evaluated diets, NDF intake was lower (7.9 to 9 g/kg body weight) than the normal range (11-13 g/kg body weight) for the negative effect of rumen fill on feed intake to take place (Mertens, 1994). Furthermore, despite its high NDF content, BMB has a low contribution to the rumen fill effect because of the reduced particle size.

The similar TDN intake can be attributed mainly to the similar DM intake between diets. In addition, the higher digestibility of the fiber in the diets with higher proportions of sugarcane and BMB may have increased energy intake, contributing to prevent significant differences in relation to diets with higher concentrate. In diets with inclusion of BMB, energy intake is normally maintained by extending the feeding time (Cruz et al., 2012; Silva et al., 2012). However, in sugarcane-based diets, increasing the proportion of roughage usually reduces energy intake as a result of the reduction in DM intake, especially when the sugarcane reaches a proportion equal to or greater than 60% of the diet dry matter (Magalhães et al., 2006; Rotta et al., 2014; Salomão et al., 2015).

Inclusion of BMB increases the passage rate of the feed because of its small particle size, reducing the apparent digestibility of diets (Miotto et al., 2013). In this regard, the higher digestibility of the fiber fraction in the diets that associated the greater proportion of sugarcane and BMB inclusion level might be indicating a positive association effect of these feedstuffs on ruminal digestion, which was possibly associated with the reduction of the passage rate of BMB because of the greater amount of long fibers from diets with higher proportion of roughage. The inclusion of BMB appears to benefit the use of diets with higher proportions of sugarcane, as an increase in the proportion of this roughage in the diet of cattle has been associated with reduced digestibility because of their indigestible fiber content (Magalhães et al., 2004, 2006).

The similar animal performance for the different diets can be attributed to the similar DM intake and especially the similar energy intake. These results were similar to those presented by Barros et al. (2009), who found that sugarcane replacing sorghum silage (0, 30, 70, and 100%) did not affect animal performance. Rangel et al. (2010) evaluated diets with sugarcane associated with different levels of concentrate (1.3, 2.0, and 2.7 kg/day) relative to a diet based on corn silage with 1.3 kg/day of concentrate and found that an increase in the proportion of sugarcane in the diet reduced average daily gain; however, diets with 45% sugarcane provided similar (802 vs 892 g/day) weight gains to dairy heifers compared with diets with corn silage.

As for the animal response to BMB inclusion in diets, the literature (Silva et al., 2012; Cruz et al., 2014; Santana et al., 2015) shows that when inclusion levels are low to moderate (226.8 to 422.4 g/kg of the diet DM), no changes in animal performance are observed, reflecting the similar energy intake. Nevertheless, Miotto et al. (2013)

and Alencar et al. (2015) showed that the average daily gain of feedlot cattle began to show a significant decline as the inclusion of BMB approached 500 g/kg of diet dry matter, after which the energy intake did not support the maintenance of animal performance.

The similar feed conversion between BMB levels can be attributed, mainly, to the similar animal performance. These results were consistent with some reported in the literature (Silva et al., 2012; Cruz et al., 2014; Santana et al., 2015), which have demonstrated that when BMB inclusion levels are low to moderate, the lack of change in animal performance usually results in similar feed conversion, even when DM intake is changed. However, when the BMB inclusion levels reduced animal performance, which occurred for higher levels of BMB inclusion in this study, feed conversion increased (Miotto et al., 2013; Alencar et al., 2015). For the use of sugarcane, on the other hand, the obtained results were similar to those reported by Pinto et al. (2010), who evaluated different proportions of sugarcane replacing sorghum silage and found no changes in feed conversion of confined cattle, despite the lower weight gain in diets with sugarcane.

The higher carcass finishing in feedlot animals fed diets with a lower proportion of sugarcane can be explained by their higher energy content (Table 5). Moreover, the lack of variation for other carcass characteristics, according to the variation factors, can be attributed to the similar body weight at slaughter. Alencar et al. (2016) evaluated BMB inclusion (0, 12, 24, 35, and 48% dry matter) in pearl millet grain-based diets and a standard corn grain-based diet and found no effect of BMB inclusion on carcass characteristics of feedlot cattle slaughtered at similar body weights. Santana et al. (2014) found that the main carcass quantitative characteristics were not changed by addition of 412.4 g/kg of BMB to diets based on whole or ground corn grain. However, these authors found that BMB inclusion in whole-corn grain diets negatively affected carcass yield, the percentage of pistol cut, and the yield of this cut in relation to diets with ground corn.

Regarding the use of sugarcane, results were consistent with those obtained by Pinto et al. (2010), who did not find changes in weight or carcass composition by replacing sorghum silage with sugarcane. Likewise, Rotta et al. (2014) did not find changes in carcass weight, degree of fatness, yield, or cooling loss testing different sugarcane ratios in feedlot cattle diets, which can be attributed to similar slaughter weights. However, these researchers found that diets with different proportions of sugarcane provided worse results for carcass traits compared with diets with different proportions of corn silage, except for degree of fatness, which was similar between diets with the different proportions of roughage used.

Conclusions

Inclusion of babassu mesocarp bran enables the use of larger proportions of sugarcane as a result of increased digestibility of the fiber fraction of feedlot cattle diets without changing the animal performance or main carcass characteristics of economic importance.

Acknowledgments

We thank the Conselho Nacional de Pesquisa e Desenvolvimento Científico e Tecnológico (CNPq) for financial support.

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