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Original

Intake pattern and feed sorting of beef cattle fed different sources of corn in a feedlot

Patrón de consume y consume selectivo de ganado vacuno alimentado con diferentes fuentes de maíz en un confinamiento

Matheus Silva Rodrigues[1]; Rowberta Teixeira dos Santos[1];
Lorena Martins Olieira[1]; Eduardo Rodrigues de Carvalho[1*].

[1]Instituto Federal de Educação, Ciência e Tecnologia Goiano (Campus Iporá), Iporá, Goiás State, Brazil.
*Correspondence: eduardo.carvalho@ifgoiano.edu.br

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ABSTRACT

The objective of this experiment was to determine the feed intake pattern and feed sorting of 30 Nelore males finished in a feedlot fed diets based on three different sources of corn: whole crop silage (WCS), high moisture corn (HMC) or corn grain (CG). Feed intake pattern and feed sorting were determined on days 13, 27, 41, 55, 69, and 83 days after the beginning of the experiment in three times relative to feed delivery (4, 10, and 24 hours). Diets were size-separated using the three-screen (19, 8, and 4 mm) and a bottom pan to yield long (>19 mm), medium (<19, >8 mm), short (<8, >4 mm) and fine (<4 mm) particles. Feed sorting was calculated by the actual dry matter (DM) intake of each particle size expressed as a % of the theoretical DM intake of the corresponding particle size. There was no response (p>0.05) of corn source on feed intake pattern. Regardless of the source of corn, animals expressed a preferential consumption or sorting for the long (104.01% for WCS, 126.99% for HMC, and 132.58% for CG) and medium (116.66% for WCS, 109.95% for HMC, and 135.14% for CG) particles of the diets, which may be a beneficial aspect in terms of rumen motility as well as maintaining rumen pH in an adequate range.

Keywords: Grain; high moisture; Nelore; particles; preference; PSPS; silage.

RESUMEN

El objetivo de este experimento fue determinar el patrón de consumo y consumo selectivo de 30 machos Nelore terminados en un confinamiento y alimentados con dietas basadas en tres fuentes diferentes de maíz: ensilaje de cosecha entera (ECE), maíz de alta humedad (MAH) o maíz en grano (MG). El patrón de consumo y consumo selectivo fueran determinados a los 13, 27, 41, 55, 69 y 83 días después del inicio del experimento en tres tiempos después del inicio de la alimentación (4, 10 y 24 horas). Las dietas fueran separadas por tamaño utilizando tres cribas (19, 8 y 4 mm) y una cubeta inferior para obtener partículas largas (>19 mm), medianas (<19, >8 mm), cortas (<8, >4 mm) y muy cortas (<4 mm). El consumo selectivo se calculó mediante el consumo real de la materia seca (MS) de cada tamaño de partícula expresado como una % de la ingesta teórica de MS del tamaño de partícula correspondiente. No hubo respuesta (p>0.05) de la fuente de maíz sobre el patrón de consumo de alimento. Independientemente de la fuente de maíz, los animales expresaron una preferencia por las partículas largas (104.01% para ECE, 126.99% para MAH y 132.58% para MG) y medias (116.66% para ECE, 109.95% para MAH y 135.14% para MG) de las dietas, lo que puede ser un aspecto beneficioso en términos de la motilidad ruminal, así como también para mantener el pH ruminal en un nivel adecuado.

Palabras clave: Alta humedad; ensilaje; grano; Nelore; partículas; preferencia; PSPS.

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INTRODUCTION

The strategy to feed beef cattle finished in a feedlot with a total mixed ration (TMR) has been common for decades. There are various advantages in mixing all feed ingredients in one load as a TMR and deliver it in a feed trough, such as provide a well-balanced diet to meet the daily nutritional demands of beef cattle finished in feedlot, maximize labor, and monitor the diet ingredients outflow in a feedlot.

Nonetheless, cattle have an intrinsic behavior to sort either for or against the various ingredients of the diet according to taste, nutritional value, and mostly particle size (1), which is commonly known as feed sorting.

Feed sorting has been mostly studied on dairy cattle in several experiments in the US and Canada to determine the response of different feeds, ration characteristics, feeding strategies, and management factors on the feed sorting behavior. Overall, authors have reported that dairy cattle fed a TMR have demonstrated a typical pattern of refusing or sorting against the long particles (fibrous components) of the diet and a preferential consumption or sorting for the small particles (rich in highly-fermentable carbohydrates) of the ration (2,3,4,5,6).

Such behavior of sorting the TMR ingredients may alter the nutritional content of the diet throughout the day in the feed bunk in comparison with the initial formulation at feed delivery, which in turn may lead to a daily intake that either does not meet the weight gain requirements for beef animals finished in a feedlot or may result in a sub-acute ruminal acidosis depending on the degree of sorting for the small particles of the ration (7). However, studies conducted in Brazil with beef cattle raised on grass and finished in a feedlot (8,9,10) have reported an opposed sorting behavior compared with US and Canadian dairy cows, in which beef animals sorted for the forage component (long particles) and against the concentrate (small particles) of the diet. It seems that the lack of a previous experience with certain feeds when animals are young (e.g. concentrate) may have a carryover effect on feed sorting in the adult life, or at least for a certain period of time (1).

Corn is a crop that can be harvested and processed in several ways to be used as an animal feed, such as silage, corn grain (11) or high moisture corn (12). To the best of our knowledge, there is not a previous report on feed sorting of beef animals fed different corn sources in a feedlot.

The objective of this research was to determine the intake pattern and feed sorting of 30 non-castrated Nelore males fed diets containing three sources of corn.

MATERIALS AND METHODS

Location and animals. The study was carried out at the Dairy and Beef Education Center of the School Farm of the Goiano Federal Institute of Education, Science, and Technology (IF Goiano), Iporá, Goiás, Brazil, from June 24 until September 23 of 2017. The experiment lasted 91 days (7 days for adaptation of the animals for the feedlot facilities and 84 days for data collection).

Diet description. Thirty non-castrated Nelore males with mean body weight (BW) of 411.3 kg and 20 months of age were randomly assigned to receive diets (treatments) based on three different corn sources (whole corn silage; WCS, high-moisture corn; HMC, and corn grain; CG) as reported in Table 1. Detailed description of the experimental diets and animal performance was reported previously (13), but some of the data are reported here to assist in the evaluation of feed intake pattern and feed sorting.

Subsequently the first randomization by initial BW to each treatment group, animals were again randomly assigned by the type of housing, where twelve animals were housed in individual pens and 18 housed in six collective pens (three animals per pen). Animals' distribution along the individual pens was the following: the first animal was fed WCS, the second was fed HMC, and the third CG (this sequence was repeated four times to sum twelve pens). The same pattern was used in the collective pens, in which the first pen with three animals was fed WCS, the second was fed HMC, and the third CG (this sequence was repeated twice to sum six pens).

Individual and collective pens had an area of 10 and 50 m^2, respectively, and volumetric size of feed bunks in individual and collective housing was 0.35 and 1.05 m^3, respectively. The feed bunk space in each collective pen was 3.8 meters long (1.26 m/animal).

Along the twelve individual pens there were six drinkers (one drinker for two animals) with an individual capacity of 240 L. Three drinkers were available at the six collective pens (one drinker for two pens) with an individual capacity of 380 L. All drinkers had automatic floats that allowed a continuous water flow.

Steers were fed once a day between 05:00 to 07:00 am in amounts that ensured 10 to 15% of orts (*ad libitum* intake). The three experimental diets were formulated and balanced to meet the recommendations for Nelore cattle finished in a feedlot with an expected weight gain of 1.8 kg/day (14).

Table 1. Ingredient and nutrient composition of the experimental diets[1]

Ingredients, % of DM	WCS[12]	HMC[13]	CG[14]
Corn + Pigeon pea + Palisade grass silage	48.0	-	-
Sugar cane silage	-	38.3	40.1
High moisture corn	-	51.5	-
Ground corn	-	-	49.5
Ground sorghum grain	42.7	-	-
Soybean meal	7.0	8.0	8.0
Urea	0.8	0.7	0.9
Mineral/vitamin premix[2]	1.5	1.5	1.5
Nutrient composition			
DM[3], %	48.38 ± 1.79	45.48 ± 1.21	49.98 ± 1.77
CP[4], % of DM	12.13 ± 0.79	11.21 ± 0.77	11.17 ± 1.67
TDN[5], % of DM	70.75 ± 6.44	71.79 ± 3.56	69.45 ± 6.41
NFC[6], % of DM	39.58 ± 9.06	45.06 ± 5.42	39.62 ± 8.13
NDF[7], % of DM	40.30 ± 9.84	36.53 ± 6.43	42.78 ± 10.50
ADF[8], % of DM	23.38 ± 6.33	23.06 ± 4.08	25.03 ± 6.86
EE[9], % of DM	2.59 ± 0.78	3.09 ± 0.50	2.54 ± 0.70
Ash, % of DM	5.41 ± 0,63	4.11 ± 0,14	4.90 ± 0,64
Ca[10], % of DM	0.34 ± 0.04	0.22 ± 0.07	0.31 ± 0.07
P[11], % of DM	0.26 ± 0.03	0.17 ± 0.02	0.21 ± 0.05

[1]Mean analysis of composite samples (n = 6), [2]Contained 18% Ca, 20 g/kg P, 17g/kg Mg, 26.7g/kg S, 66.7 g/kg Na, 25.2 mg/kg Co, 416 mg/kg Cu, 490 mg/kg Fe, 25.2 mg/kg I, 832 mg/kg Mn, 7 mg/kg Se, 2,000 mg/kg Zn, 833.5 mg/kg Monenzin, 83,200 IU/kg vitamin A, 10,400 IU/kg vitamin D, 240 IU/kg vitamin E, [3]Dry matter, [4]Crude protein, [5]Total digestive nutrients, [6]Non-fiber carbohydrates = 100 - CP% - NDF% - EE% - ash%, [7]Neutral detergent fiber, [8]Acid detergent fiber, [9]Ether extract, [10]Calcium, [11]Phosphorus, [12]Whole crop silage, [13]High moisture corn, [14]Corn grain

Diet samples were collected every other week and stored frozen at -4ºC. Soon after the end of the experiment, samples were thawed at room temperature, merged to form one composite sample per treatment and dried in a forced-air circulation oven for 72 hours at 65ºC for dry matter (DM) analysis (15). Diet samples were then ground using a Willey mill to pass a 1-mm screen and analyzed for CP, EE, ash, Ca, P (15), neutral detergent fiber, and acid detergent fiber (16).

Sample collection and analyses. Feed intake pattern and feed sorting were determined on days 13, 27, 41, 55, 69, and 83 days after the beginning of the experiment in three times post-feeding (4, 10, and 24 hours). In each of the times indicated, the amount of feed from the individual and collective pens was briefly removed, weighed, returned to the corresponding pen, and 0.5 kg samples were collected for DM analyses (15). Feed intake pattern was calculated by the following:

DM intake (0-4 hours) = kg of DM offered at feed delivery subtracted from kg of DM remaining at 4 hours post-feeding;
DM intake (4-10 hours) = kg of DM remaining at 4 hours post-feeding subtracted from kg of DM remaining at 10 hours post-feeding;
DM intake (10-24 hours) = kg of DM remaining at 10 hours post-feeding subtracted from kg of DM remaining at 24 hours post-feeding.

Straight before feed intake pattern sampling, diet samples of 1.4 L were collected at feed delivery (time zero), 4, 10, and 24 hours post-feeding, and stored frozen at -4ºC. Soon after the end of the experiment, diet samples were thawed at room temperature and separated using the three-screen (19, 8, and 4 mm) and a bottom pan Penn State Particle Separator (PSPS, Nasco, Fort Atkinson, WI) to yield long (>19 mm), medium (<19, >8 mm), short (<8, >4 mm) and fine (<4 mm) particles (17,18).

Post-separated materials were placed in aluminium trays, identified according to the animal's ear-tag, type of diet (WCS, HMC or CG), days of evaluation (13, 27, 41, 55, 69, and 83) and hours post-feeding (0, 4, 10, and 24) for DM analyses (15).

The sorting index or feed sorting of the experimental diets was calculated by expressing the actual DM intake of each particle size as a percentage of the theoretical DM intake of the corresponding particle size (2), as described in the equations below:

$$TDMI_{ps} = DMI_{t} * PSD_{t0}$$

$$ADMI_{ps} = DMI_{t} * PSD_{t4,t10,t24}$$

$$SI(\% \text{ of } DM) = (ADMI_{ps} * 100)/TDMI_{ps}$$

$TDMI_{ps}$ = theoretical DM intake by particle size (>19 mm; <19, >8 mm; <8, >4 mm; <4 mm);
DMI_t = DM intake between 0-4, 4-10, and 10-24 hours post-feeding;
PSD_{t0} = particle size distribution at feed delivery (time zero);
$ADMI_{ps}$ = actual DM intake by particle size (>19 mm; <19, >8 mm; <8, >4 mm; <4 mm);
$PSD_{t4, t10, t24}$ = particle size distribution at 4, 10, and 24 hours post-feeding;
SI (% of DM) = sorting index or feed sorting.

Values = 100% indicate absence of sorting by particle size;
Values <100% indicate selective refusal or sorting against by a certain particle size class;
Values >100% indicate preferential consumption or sorting for by particle size class (2).

The model accounted for the effects of diet (d), housing (h), days of the experiment (days), hours post-feeding (t), d×h, d×days, d×t, h×days, h×t, days×t, d×h×days, d×h×t, d×days×t, h×days×t, and d×h×days×t, according to the following equation:

$$y_{ijklm} = \mu + d_i + h_j + days_k + t_l + dh_{ij} + ddays_{ik} + dt_{il} + hdays_{jk} + ht_{jl} + dayst_{kl} + dhdays_{ijk} + dht_{ijl} + ddayst_{ikl} + hdayst_{jkl} + dhdayst_{ijkl} + e_{ijklm}.$$

where y = independent variable, μ = mean, and e = experimental error. When a fixed effect was significant at a 5% probability, means were compared using the Tukey test. Values are reported as least square means and associated standard errors of means (SEM).

Feed intake pattern analyses were run separately between individual and collective pens, therefore the fixed effect of housing was not included for this variable.

RESULTS

All classes of particle sizes separated by the three-screen and a bottom pan PSPS were affected (p≤0.05) by the source of corn within each experimental diet (Table 2).

The % of DM retained as long particles (>19 mm) was similar (p>0.05) between HMC (16.45%) and CG (18.60%), but both were greater (p≤0.05) than WCS (11.24%). A shift was observed in the distribution of medium particles (<19, >8 mm), where the highest (p≤0.05) % of DM retained in this particle size was detected in WCS (31.46%), followed by HMC (26.16%) and CG (11.40%).

The HMC diet had the greatest (p≤0.05) % of DM retained as short particles (25.22%), followed by CG (13.04%) and WCS (10.78%), whereas CG had the highest (p≤0.05) % of DM retained as fine particles (5.69%), followed by WCS (4.65%) and HMC (3.21%).

Table 2. Particle size distribution of the experimental diets at the moment of feed delivery.

% of DM[1] retained on screen	WCS[2]	HMC[3]	CG[4]	SEM[5]	P
Long (>19 mm)	11.24 b	16.45 a	18.60 a	0.69	<0.05
Medium (<19, >8 mm)	31.46 a	26.16 b	11.40 c	0.36	<0.05
Short (<8, >4 mm)	10.78 c	25.22 a	13.04 b	0,24	<0.05
Fine (<4 mm)	4.65 b	3.21 c	5.69 a	0.71	<0.05

[1]Dry matter, [2]Whole crop silage, [3]High moisture corn, [4]Corn grain, [5]Standard error of means

Feed intake pattern was not changed (p>0.05) by source of corn (Tables 3 and 4). Animals housed in individual pens increased (p≤0.05) the amount of DM ingested in the latter phases of the feedlot compared with the earlier stages (3.55; 3.84; 3.85; 3.58; 3.86; and 4.39 kg of DM, respectively for days 13, 27, 41, 55, 69, and 83) (Tables 3 and 4).

Regardless of the type of housing, animals increased (p≤0.05) the DM intake between 0-4 and 4-10 hours after feed delivery in relation to 10-24 hours (4.95; 4.52; and 2.05 kg of DM, respectively for 0-4, 4-10, and 10-24 hours in individual housing, and 15.03; 14.11; and 8.57 kg of DM, respectively for 0-4, 4-10, and 10-24 hours in collective housing) (Tables 3 and 4).

Table 3. Effect of corn source on the feed intake pattern of 30 Nelore steers finished in a feedlot and housed in individual or collective pens

Item	Days[2]	Source of corn	Time relative to feeding (hours)			SEM[6]
			0-4	4-10	0-24	
kg of DM[1] ingested (individual pens)	13	WCS[3]	4.81	4.55	2.73	0.54
		HMC[4]	3.77	3.67	2.34	
		CG[5]	4.28	3.49	2.32	
	27	WCS	5.95	3.99	1.15	0.54
		HMC	5.89	4.14	1.84	
		CG	5.21	4.40	1.99	
	41	WCS	6.24	3.36	1.75	0.69
		HMC	5.62	3.40	3.12	
		CG	3.74	4.31	3.11	
	55	WCS	5.41	4.72	1.32	0.51
		HMC	2.72	4.38	2.06	
		CG	4.40	4.57	2.62	
	69	WCS	5.71	4.19	1.80	0.55
		HMC	4.14	2.98	2.1	
		CG	5.75	4.92	3.16	
	83	WCS	6.25	6.21	0.50	0.47
		HMC	4.91	7.36	1.40	
		CG	4.42	6.80	1.67	
kg of DM ingested (collective pens)	13	WCS	16.75	17.50	9.75	2.91
		HMC	10.79	11.39	10.92	
		CG	13.11	10.43	6.15	
	27	WCS	16.69	15.72	6.84	0.77
		HMC	13.18	12.00	6.95	
		CG	12.85	14.96	5.90	
	41	WCS	15.15	13.28	12.03	1.59
		HMC	13.60	11.43	12.40	
		CG	15.40	12.06	10.86	
	55	WCS	15.58	13.58	8.51	0.96
		HMC	16.06	11.39	10.47	
		CG	14.84	12.46	8.38	
	69	WCS	16.89	12.37	12.40	0.75
		HMC	14.14	11.82	12.97	
		CG	14.35	13.72	10.06	
	83	WCS	25.89	21.76	2.56	3.37
		HMC	12.68	20.04	3.32	
		CG	12.63	18.07	3.81	

[1]Dry matter, [2]Days relative to the beginning of the experiment when feed intake pattern was determined, [3]Whole crop silage, [4]High moisture corn, [5]Corn grain, [6]Standard error of means

Table 4. Probabilities associated with the effect of treatment, days of evaluation, time relative to feeding, and their interactions on the feed intake pattern of 30 Nelore steers fed diets with three corn sources in a feedlot, and housed in individual or collective pens

Kg of DM ingested	P-values						
	Trt[1]	Days[2]	Time[3]	Trt * days	Trt * time	Days * time	Trt * days * time
Individual pens	0.44	<0.05	<0.05	<0.05	<0.05	<0.05	0.38
Collective pens	0.10	0.06	<0.05	0.47	0.06	<0.05	0.31

[1]Whole crop silage (WCS) or high moisture corn (HMC) or corn grain (CG), [2]Days relative to the beginning of the experiment (13, 27, 41, 55, 69, and 83) when feed intake pattern was determined, [3]Hours relative to feeding (0-4, 4-10, and 10-24)

There was a response ($p \leq 0.05$) of corn source on the feed sorting of long (>19 mm), medium (<19, >8 mm), and short (<8, >4 mm) particles of the experimental diets (Tables 5 and 6).

Animals fed all three diets with different corn sources expressed a behavior of sorting for long particles (>19 mm) (104.01% for WCS, 126.99% for HMC, and 132.58% for CG). The CG diet increased ($p \leq 0.05$) the preference for this particle size compared with WCS, but sorting index for long particles (>19 mm) did not differ ($p > 0.05$) between HMC and CG, as well as between WCS and HMC.

Table 5. Effect of corn source on the feed sorting of 30 Nelore steers finished in a feedlot and housed in individual or collective pens.

Sorting index (%)	Time relative to feeding (hours)	Source of corn	Days[4] of evaluation						SEM[5]
			13	27	41	55	69	83	
		WCS[1]	70.27	184.58	120.31	123.45	127.00	68.80	
	0-4	HMC[2]	51.03	96.25	138.52	160.06	117.85	96.14	10.46
		CG[3]	43.13	106.22	132.45	188.38	132.29	98.66	
		WCS	96.29	137.67	103.84	105.02	105.95	60.91	
Long (>19 mm)	4-10	HMC	82.41	109.38	105.41	141.01	123.13	97.03	10.05
		CG	85.01	125.34	107.83	166.13	162.25	92.76	
		WCS	73.37	152.88	129.36	106.69	63.60	42.13	
	10-24	HMC	100.43	168.71	207.01	168.35	231.22	91.79	10.24
		CG	94.53	146.03	196.25	220.16	195.63	93.17	
		WCS	149.53	118.53	116.39	115.70	102.65	108.03	
	0-4	HMC	171.02	107.49	101.99	98.33	80.22	112.91	5.36
		CG	200.26	110.75	106.18	109.11	110.20	120.27	
		WCS	136.37	121.56	119.58	109.66	99.84	101.85	
Medium (<19, >8 mm)	4-10	HMC	168.20	101.72	104.74	82.41	74.76	122.14	5.28
		CG	238.50	116.26	106.94	94.99	122.76	121.21	
		WCS	145.84	125.39	127.53	105.82	103.29	92.24	
	10-24	HMC	161.32	110.32	99.82	86.61	67.75	127.25	5.70
		CG	249.66	130.99	125.32	112.85	133.12	123.17	
		WCS	101.27	110.56	110.01	95.70	119.50	94.00	
	0-4	HMC	100.38	95.84	93.46	91.35	105.50	94.42	4.05
		CG	128.33	105.99	100.57	102.22	91.64	105.31	
		WCS	101.83	115.95	100.99	107.48	123.31	94.25	
Short (<8, >4 mm)	4-10	HMC	90.81	105.11	100.08	105.83	109.11	91.54	3.98
		CG	136.35	115.82	109.95	103.72	110.92	107.44	
		WCS	86.13	119.82	111.41	111.96	148.48	94.38	
	10-24	HMC	79.40	94.10	92.45	86.87	83.42	90.23	4.19
		CG	115.21	114.34	111.75	111.45	93.88	107.45	
		WCS	88.39	82.06	86.25	84.37	88.00	105.43	
	0-4	HMC	99.29	99.04	93.50	80.04	103.71	99.14	3.77
		CG	112.97	95.72	93.75	77.83	91.64	97.21	
		WCS	86.00	83.12	88.57	89.35	96.35	114.28	
Fine (<4 mm)	4-10	HMC	75.86	93.58	95.73	94.12	103.55	94.56	3.70
		CG	70.35	91.22	97.28	90.48	79.30	97.26	
		WCS	80.48	81.17	78.35	90.53	97.76	124.74	
	10-24	HMC	73.65	79.82	77.73	79.79	75.82	93.91	4.07
		CG	69.22	83.02	74.16	70.05	69.44	97.50	

[1]Whole crop silage, [2]High moisture corn, [3]Corn grain, [4]Days relative to the beginning of the experiment when feed sorting was determined, [5]Standard error of means.

Table 6. Probabilities associated with the effect of treatment, days of evaluation, time relative to feeding, and interactions on the feed sorting of 30 Nelore steers fed diets with three corn sources in a feedlot, and housed in individual or collective pens.

Particle size	P-values												
	Trt	Days	Time	Housing	Trt *days	Trt *time	Trt *housing	Days *time	Days *housing	Time * housing	Trt *days *time	Trt *days *housing	Trt *time *housing
Long (>19 mm)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.95	<0.05	0.16	<0.05	0.76	0.07	0.14
Medium (<19, >8 mm)	<0.05	<0.05	0.13	<0.05	<0.05	<0.05	0.62	0.38	<0.05	0.06	0.59	0.33	0.64
Short (<8, >4 mm)	<0.05	<0.05	0.15	<0.05	0.08	0.07	0.63	0.26	0.20	0.15	0.50	0.10	0.95
Fine (<4 mm)	0.54	<0.05	<0.05	0.91	0.05	<0.05	0.43	<0.05	0.12	<0.05	0.85	0.15	0.26

Likewise with long particles (>19 mm), animals also sorted for medium particles (<19, > 8 mm) regardless the diet type (116.66% for WCS, 109.95% for HMC, and 135.14% for CG), but in this particular particle class the CG diet increased ($p \leq 0.05$) the preference for medium particles (<19, >8 mm) in relation to both WCS and HMC, whereas WCS and HMC had similar ($p > 0.05$) sorting index for medium particles (<19, >8 mm).

Feeding WCS and CG resulted in a preferential consumption for short particles (<8, >4 mm) (108.17 and 109.57% for the WCS and CG diets, respectively). Contrarily, feeding HMC diet resulted in selective refusal for short particles (<8, >4 mm) (95%). WCS and CG had similar ($p > 0.05$) sorting index for short particles (<8, >4 mm) and both diets increased ($p \leq 0.05$) the preference for such particles when compared with the HMC diet.

DISCUSSION

The primary objective in this study was to determine the effects of feeding diets with a single corn source on the feed intake pattern and feed sorting of Nelore steers finished in a feedlot.

The analyses of the particle size distribution at the moment feed was delivered to animals demonstrated that all four particle classes were influenced by diet composition (Table 2). In order to formulate and balance diets that intended to be similar in nutrient composition, the inclusion of a coarser roughage (such as sugar cane silage) increased the proportion of long particles (>19 mm) in the HMC and CG diets. Contrarily, feeding WCS as a single corn source increased the proportion of medium particles (<19, >8 mm).

HMC as a single corn source was mostly retained on the third sieve, which in turn increased the proportion of short particles (<8, > 4 mm) in the HMC diet, whereas ground corn was retained on the bottom pan, which resulted in an increased proportion of fine particles (<4 mm) in the CG diet.

Therefore the data reported in Table 2 indicate that the overall physical characteristic of feeds, such as forage particle length and degree of grain grinding have an impact on the distribution of particle classes of beef cattle feedlot diets.

Although there was no response of corn source on feed intake pattern, animals expressed a consistent behavior of an increased DM intake towards the end of the experiment and within the first hours after fresh feed is delivered, which corroborates previous findings (8, 9,10).

Animals that took part in this study were raised on grass plus a daily supplement constituted by a mixture of minerals, protein, and energy feeds (2g/kg of body weight) throughout the entire grazing period prior to this experimental feedlot (13). The first time animals were fed larger amounts of concentrate was during the feedlot phase, therefore the absence of a former experience with high amounts of concentrate feeds during the early stages of life may have been the primary cause for the preferential consumption for long (>19 mm) and medium (<19, >8 mm) particles, especially in the CG diet with the inclusion of a coarser forage (sugar cane silage), as well as the selective refusal for fine particles (<4 mm).

Therefore the data reported here somehow contradict previous studies that consistently reported a selective consumption for the small components of the diet on dairy cows fed concentrates since they were young calves, as opposed to beef animals in the present experiment that sorted for the long and medium particles of all experimental diets, possibly because the feeding regime was based on grass since early stages of life until animals were finished in a feedlot with larger amounts of concentrate.

In conclusion, all experimental diets based on different sources of corn resulted in a preferential intake for long and medium particles, which may prove beneficial to stimulate rumination and maintain rumen health, therefore should be recommended for beef animals finished in a feedlot. Thus, other variables should be considered for the choice of which source of corn can be used as a feed ingredient for beef cattle feedlot diets, such as cost, technology level of the feedlot, machinery, labor, weather conditions, and others.

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Conflict of interest

The authors declare no conflict of interest throughout all steps of the present work (data collection, statistical analysis, laboratory analyses, and manuscript writing).

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