



Concentrate levels of crossbred bulls slaughtered at 16 or 22 months: performance and carcass characteristics

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ABSTRACT. This study was performed to assess the animal performance of 97 bulls, $\frac{1}{2}$ Purunã vs. $\frac{1}{2}$ Canchim, that were slaughtered at 16 (16M) or 22 (22M) months with three concentrate levels (0.8, 1.2, and 1.6%) of body weight (BW). The initial body weight was lower for the 16M bulls. The final body weight and hot carcass weights were similar between the two slaughter ages. The hot carcass dressing was higher for 22M bulls. The average daily gain was higher for 16M bulls. The feed intake and dry matter feed conversion were similar between 16 and 22M bulls. The carcass length, marbling, and bone percentage were lower for 16M bulls. However, the *Longissimus dorsi* muscle area was higher for 16M bulls. The leg length, cushion thickness, fat thickness, conformation, colour, texture, muscle percent, and fat percent were similar between 16 and 22M bulls. The final and hot carcass weights were lower for bulls that were fed with 0.8% of BW. The carcass dressing was similar for the three concentrate levels. The average daily gain was higher for bulls that were fed with 1.6% of BW of concentrate and lower for those that were fed with 0.8%. The concentrate levels had no effect on carcass characteristics, feed intake, and dry matter conversion.

Keywords: bovine, feed intake, crossbreeding, *Longissimus*.

Níveis de concentrado na dieta de touros abatidos aos 16 ou 22 meses: desempenho e características de carcaça

RESUMO. Este estudo foi realizado para avaliar o desempenho animal de 97 touros, $\frac{1}{2}$ Purunã vs $\frac{1}{2}$ Canchim, que foram abatidos aos 16 (16M) ou 22 (22M) meses, com três níveis de concentrado (0,8, 1,2 e 1,6%) do peso vivo. O peso inicial foi menor para os touros 16M. O peso final e peso de carcaça quente foram similares entre as duas idades de abate. O rendimento de carcaça quente foi maior para os touros 22M. O ganho médio diário foi maior para os touros 16M. O consumo de ração e conversão alimentar da matéria seca foi semelhante entre os touros 16 e 22M. O comprimento de carcaça, marmorização e percentagem de ossos foram menores para os touros de 16M. No entanto, a área do músculo *Longissimus dorsi* foi maior para os touros de 16M. O comprimento da perna, espessura de coxão, espessura de gordura, conformação, cor, textura, percentual de músculo e gordura foram semelhantes entre os touros de 16 e 22M. Os pesos finais e de carcaça quentes foram menores para os touros, que foram alimentados com 0,8% de concentrado do PV. O rendimento de carcaça foi semelhante para os animais dos três níveis de concentrado. O ganho médio diário foi maior para os touros, que foram alimentados com 1,6% do peso vivo de concentrado e menor para aqueles que foram alimentados com 0,8%. Os níveis de concentrado não tiveram efeito sobre as características de carcaça, ingestão e conversão de matéria seca.

Palavras chave: bovinos, consumo, cruzamentos, *Longissimus*.

Introduction

The Brazilian beef herd is essentially composed of *Bos taurus indicus* – zebu (ANUALPEC, 2014), which are slaughtered at an advanced age between three and four years; they have a lower quality meat than *Bos taurus taurus* animals and their crossbreeds (Ducatti et al., 2009; Maggioni et al.,

2012; Rotta et al., 2009). The lower meat quality is directly related to the slaughter age and the zebu genes, which have high levels of calpains, thereby resulting in a firmer meat (O'Connor et al., 1997; Shackelford et al., 1994). Thus, the productive index of Brazilian beef livestock must be improved to reduce the slaughter age and to attain improvements in carcass quality (Ito et al., 2010; Ito et al., 2012a, b;

Rotta et al., 2009).

One of the alternatives for finishing young animals is at the feedlot, which partly represents the addition to technology among cattle raisers due to the high volume, due to the high volume of information offered by research centres. Thus, it is possible to slaughter animals between 14 to 18 months old and to obtain standardized carcasses of high quality (Ito et al., 2010; Ito et al., 2012a, b).

On the other hand, in order to optimize the livestock systems, it is necessary to adjust the quantity and quality of the ration based on animals' requirements (NRC, 2000). The voluntary intake is the determinant for a balanced diet, and establishing a strategy allows for better cattle performance (Forbes, 1988; Maggioni et al., 2009). The concentrate level in cattle diets determines the animal performance, feed efficiency, and carcass characteristics, with better results in finished cattle when they are fed with high concentrate levels (Silveira et al., 2009). Thus, it is necessary to determine the slaughter age and concentrate levels that are the most adequate for the requirements of crossbred cattle finished in a feedlot in order to promote a better use of nutrients, animal response, and carcass quality.

The objective of this study was to evaluate animal performance and carcass characteristics of ½ Purunã vs. ½ Canchin bulls slaughtered at 16 or 22 months and fed with three concentrate levels in the diets (0.8, 1.2, or 1.6% in relation to the BW).

Material and methods

Local animal management and sampling

This work was conducted at a model farm at the experimental station of the Agronomic Institute of Paraná - Iapar, located at Ponta Grossa city, south of Brazil. Ninety-seven ½ Purunã vs. ½ Canchin bulls were divided according to their age (16 - 16 or 22months- 22M) and were fed with three concentrate levels (0.8, 1.2, or 1.6% of BW). In the 16M system from calving to 90 days, the calves were kept with the cows in annual winter pastures. After weaning (90 days), the calves were kept in *Hemarthria altissima* pastures with concentrate supplementation (1.5 kg d⁻¹ of the mix consisting of 73% of grain ground corn + 25% of soybean meal + 2% mineral) during the winter. The bulls were housed in collective pens with an average age of 10 months.

At twelve months, the bulls were moved to individual pens and remained there during the next four months. In the 22M system, from calving to 90

days, the calves were kept with the cows in annual winter pastures. After weaning (90 days), the calves were kept in *Hemarthria altissima* pastures with concentrate supplementation (1.5 kg d⁻¹ of the mix consisting of 73% of grain ground corn + 25% of soybean meal + 2% mineral) during the winter. At 18 months, the animals were housed individually and remained there during the next four months.

The 16 and 22M bulls that were fed concentrate at 0.8% of BW received a diet with a forage:concentrate ratio of 73:27 and 72:28, respectively. The 16 and 22M bulls that were fed concentrate at 1.2% of BW received a diet with a forage:concentrate ratio of 59:41. The 16 and 22M bulls that were fed concentrate at 1.6% of BW received a diet with a forage:concentrate ratio of 47:53 and 44:56, respectively. The forage consisted of maize silage, and concentrate was composed of 73% of grain ground corn + 25% of soybean meal+2% mineral.

The initial body weight (IBW) in the individual pens for the 16M bulls that were fed concentrate at 0.8% of BW was 269.5 ± 11.8 kg, while bulls that were fed concentrate at 1.2% of BW were 269.0 ± 8.5 kg, and bulls that were fed concentrate at 1.6% of BW were 252.3 ± 10.3 kg. For the 22M group, the IBW for bulls that were fed concentrate at 0.8% of BW was 291.1 ± 10.9 kg, bulls that were fed concentrate at 1.2% of BW were 301.9 ± 12.2 kg, and bulls that were fed concentrate at 1.6% of BW were 280.2 ± 10.9 kg.

In the feedlot, the bulls remained in individually covered pens with an 8 m² area, concrete floor, forage, concentrate and mineral feeder, and a drinker that was regulated by an automatic float system. The bulls were weighed at the beginning of the experiment. After, periodic weights were conducted every 28 days following a solid and liquid fasting period of 16h, which was obtained by removing the feed at 16h of the previous day.

The feed was managed in two daily meals at 8 and at 14h. The next morning before the first meal, the orts were removed to calculate the feed intake and the daily adjustment of the silage that was provided. The feed was adjusted to obtain 5% of orts of the total that was provided. The mineral supplement was provided freely in individual salt feeder, and suited to meet the animals' requirements.

Animal performance

The average daily gain (ADG) was calculated based on the difference between the IBW and final body weight (FBW), divided by the days in the

experimental period. The DM intake (DMI - kg d⁻¹) was calculated based on the DM percentage that was offered and theorts, according to the equation $DMI \text{ kg} = (\%DM_{\text{offered}} - \%DM_{\text{morts}})/FBW$, The DMI per 100 kg of BW was calculated based on the rate between the daily dry matter intake divided by the cattle average weight and multiplied by 100.

The feed conversion (FC) was calculated as the ratio between the intake and the animal performance, according to the equation $FC = (DMI/ADG)$.

Carcass characteristics

At the end of the experiment, the bulls were weighed after 16h of fasting from solids and liquids and were slaughtered at a commercial slaughter house Curitiba, Paraná State, Brazil. The bulls were sensitized with a compressed air pistol and were bled from the vessels of neck after which the head, leather, viscera, tail, claws, diaphragm, and excess visceral fat were removed. Next, carcasses were divided medially through the sternum and vertebral column. The carcasses were chilled for 24h at 4°C. After chilling them, the right side of the carcass was used to determine the quantitative characteristics.

The hot carcass weight (HCW) was determined soon after slaughter and prior to chilling the carcass. The hot carcass dressing (HCD) is the individual animal dressing percentage and was defined by the ratio $HCW:BW$. The conformation (CON) was determined after excluding fat thickness, where the highest value indicated the best conformation. CON can be considered superior, very good, good, regular, poor, or inferior; ratings may also be reported as plus, average, and minus. The carcass length (CLE) was measured from the skull board to the pubic bone on the anterior side of the first rib. The leg length (LLE) was evaluated with a wooden compass with metallic edges to measure the distance from the anterior border of the pubic bone to a middle point on the tarsal bone.

The cushion thickness (CTH) was determined by using a wooden compass with metallic edges that measured the distance between the lateral face and the median at the superior part of the cushion. The cushion is the muscle (*Biceps femoris*). The fat cover (FAT) was measured via a caliper, between the 12 and 13th ribs on *Longissimus* muscle (LM), and averaged over three points. The *Longissimus* muscle area (LMA) was measured on the right side of the carcass; after a cross-section cut was made between the 12 and 13th ribs using a compensating planimeter that measured the areas of irregularly shaped objects. The LMA of 100 kg carcass⁻¹ (LMC) is defined by the ratio $LMA:HCW$, multiplied by 100.

The marbling (MAR) was measured in the LM between the 12 and 13th ribs by using the Brazilian scoring system (18 to 16 - abundant, 15 to 13 - moderate, 12 to 10- mean, 9 to 7 -small, 6 to 4- light, and 3 to 1 -traces). The texture (TEX) was determined by the fascicle size (muscular "grain" size) and was evaluated subjectively on a point scale (very fine - 5, fine - 4, slight - 3, coarse - 2, and very coarse - 1). Muscle color (COL) was analyzed after a 24-hour carcass chilling period. Color was evaluated according to a point scale 30 min. after a cross-sectional cut was made on the LM between the 12 and 13th ribs (cherry red - 5, red - 4, slightly red - 3, dark red - 2, and dark - 1). Muscle, fat, and bone were physically separated from the LM section, collected between the 10 and 12th ribs, and were calculated individually according to Hankins and Howe (1946) as follows:

$$\%M \frac{1}{4} 6:292 \text{ p } 0:910 \text{ X1}$$

$$\%F \frac{1}{4} 1:526 \text{ p } 0:913 \text{ X2}$$

$$\%B \frac{1}{4} 2:117 \text{ p } 0:860 \text{ X3}$$

where:

X1, X2, and X3 represent muscle (MUS%), fat (FAT%), and bone (BON%) percentages, respectively.

Statistical analysis

The ninety-seven animals were distributed in a completely randomized design in a factorial 3 x 2 consisting of three levels of concentrate (0.8, 1.2, and 1.6% concentrate in relation to the body weight) and two finishing systems (16 - 16 or 22M- 22 months). The results were submitted to the analysis of variance (ANOVA) and the averages were compared by the T test (5%) using SAS (2004).

Results and discussion

No interaction was found for IBW, FBW, ADG, HCW, and HCD between the slaughter age (16M and 22M) and concentrate levels in the diets (0.8, 1.2, and 1.6% of BW, Table 1). Thus, the results were presented and discussed as principal effects.

The 16M bulls presented with a lower IBW when compared to the 22M bulls. The 16M animals started in the feedlot at 12 months, while the 22M animals started at 18 months. However, there was no difference in FBW between the 16M and 22M bulls. The similar FBW can be explained by the higher ADG value of 16M bulls than 22M bulls.

Table 1. Animal performance and carcass characteristics of ½ Purunã vs. ½ Canchim bulls finished at two ages and with three levels of concentrate in the diets.

Item	Age	Concentrate level, kg BW ⁻¹			Mean	SEM	P<
		0.8	1.2	1.6			
N		28	37	32			
Initial body weight, kg	16M	269.5	269.0	252.3	263.6	10.18	Ns
	22M	291.1	301.9	280.2	291.1	11.38	Ns
	Mean	280.3	285.5	266.3	277.4	7.67	Ns
	SEM	10.20	9.89	9.92			
	p <	*	*	*	*		
Final body weight, kg	16M	469.7b	487.0a	479.1a	478.6	8.52	*
	22M	465.5b	483.5a	484.1a	477.7	9.89	*
	Mean	467.6b	485.3a	481.6a	478.2	6.56	*
	SEM	8.21	7.76	8.32			
	p <	Ns	Ns	Ns	Ns		
Average daily gain, kg	16M	1.51	1.60	1.72	1.61	0.07	Ns
	22M	1.16	1.25	1.29	1.23	0.06	Ns
	Mean	1.33	1.43	1.51	1.42	0.06	Ns
	SEM	0.06	0.05	0.05			
	p <	*	*	*	*		
Hot carcass weight, kg	16M	257.2b	268.8a	265.9a	264.0	5.48	*
	22M	251.3b	261.8a	257.8a	257.0	6.52	*
	Mean	254.3b	265.3a	261.9a	260.5	4.15	*
	SEM	5.32	5.22	5.87			
	p <	Ns	Ns	Ns	Ns		
Hot carcass dressing, %	16M	54.7	55.2	55.5	55.1	0.45	Ns
	22M	54.0	54.1	53.3	53.8	0.44	Ns
	Mean	54.4	54.6	54.4	54.5	0.45	Ns
	SEM	0.41	0.38	0.39			
	p <	*	*	*	*		

Ns, not significant. Means followed by different letters are different (*p < 0.05).

This result shows that bulls can be slaughtered at 16 months old when using the feedlot system. The nutrient use of younger animals is better than that of older animals. Due to this, younger animals gain more weight. Results similar to those found in this paper were observed by Kuss et al. (2009) in young bulls. However, Freitas et al. (2008) and Pazdiora et al. (2009) did not observe an effect on ADG between young bulls and bulls.

The HCW did not change due to the slaughter age because no difference was found in the FBW. Similar results were observed by Pazdiora et al. (2009) in the HCW, which was justified by the similarity in the FBW between young bulls and bulls. The HCD was higher (p < 0.05) for 16M bulls than for 22M bulls. Santos et al. (2008) evaluated the carcass characteristics of super early and early animals, and reported a superior HCD in young animals. The higher value HCD for the 16M bulls may be attributed to an increase in the gastrointestinal tract in early bulls (Menezes et al., 2007).

The bulls started the experiment with similar IBW; however, bulls that were fed concentrate at 1.2 and 1.6% of BW presented with a higher FBW than bulls that were fed concentrate at 0.8% of BW. Most of the data in the literature shows that the FBW is determined by the level of concentrate in the diet (El-Memari Neto et al., 2003; Gesualdi Júnior et al.,

2000; Silveira et al., 2009). A higher value FBW is determined by a higher energy intake, since high levels of forage can inhibit the food intake through physical effects (Bogomolov et al., 2013; Mertens, 1994).

The ADG obtained from animals that were fed with higher concentrate levels in the diets occurred because of the use of a higher quality diet for these animals. Remember that CP and NDF intake were higher for cattle that were fed with higher concentrate levels in the diets, once a food substitution occurred without changing the DMI; the maize silage with lower CP and NDF content for concentrate (corn + soybean). However, Zervoudakis et al. (2001) did not observe a difference for ADG in animals that were fed with 1 or 2% of concentrate in the diets, although it was expected according to other authors that a higher ADG value would be observed with diets containing higher concentrate levels. On the other hand, Silva et al. (2005) reported a linear increase in the ADG with the increase in concentrate levels, with greater gains when diets were composed of 65% of concentrate. According to (Costa et al., 2002; Resende et al., 2001), the ADG increases for animals finished on a feedlot when the concentrate level in the diet is incremented.

The HCW was greater (p < 0.05) for bulls that were fed with higher concentrate levels (1.2 and 1.6% of BW). However, in a similar study, an effect of the concentrate level on the HCW was not observed. According to Restle (1999), the HCW is an interesting measure that slaughterhouses uses to assess the product

value acquired and the operational costs, since carcasses with different weights demand the same labour and the same processing time.

The HCD was similar among the concentrate levels 0.8, 1.2, and 1.6% of BW. However, (Costa et al., 2002; Gesualdi Júnior et al., 2000), when evaluating the concentrate level effects on the carcass dressing, observed a linear increase, but when the carcass dressing was expressed in relation to the empty body weight, no difference among the concentrate levels was found. Similarly, Silva et al. (2002) found that the principal factor influencing the increase in the carcass dressing was the linear decrease of the gastrointestinal weight when the concentrate in the diets was increased, due to the fact that animals that are fed with higher levels of concentrate presented with higher digestibility. Although, no effects on the animals carcass dressing were identified by Steen and Kilpatrick (2000) by the concentrate level in the diet.

There was no interaction for the DMI, DMI 100 kg⁻¹, CPI, NDF, NDFI, and NDFI 100 kg⁻¹ (Table 2).

The DMI was similar between 16 and 22M bulls. Corroborating with this result, Pacheco et al. (2006) did not observe a difference in the DMI between cattle finished on a feedlot and slaughtered at two different ages: super early and early. Likewise, the age difference between the two categories that

were reviewed was not significant enough to influence the DMI. The DMI in relation to the BW (2.35%) has to be considered normal for cattle finished on the 16 and 22M systems and fed with a diet containing rations of forage and concentrate close to 50%.

The 16M bulls presented with a better DMC when compared) to 22M bulls. The dry matter feed conversion was 6.34 kg of DM for each kg of bodyweight. In general, young bulls (24 months or lower) originating from *Bos Taurus vs Bos indicus* crossbreeding, finished on feedlot, and fed with a diet containing high protein levels and high energetic density presented with a DMC of 6 to 7 kg of DM for each kg of ADG.

The average CPI of 1.08 kg d⁻¹ was close to the recommended value of NRC (2000) for animals finished on a feedlot; they were expected to earn 1.30 to 1.50 kg d⁻¹, as was the case in this experiment. Furthermore, the average NDFI (0.73% of BW) was under the maximum levels that are considered to inhibit cattle intake on a feedlot when feeding concentrate at 1.2% of BW (Mertens, 1994). Thus, independent of the rearing system, the NDF level in the diets did not interfere with cattle food intake. The intake of NDF was low due to the high quality of the maize silage that was used (50% of FND).

Table 2. Animal performance of ½ Purunã vs. ½ Canchim bulls finished at two ages and with three levels of concentrate in the diets.

Variable	Age	Concentrate level, kg BW ⁻¹			Mean	SEM	P <
		0.80	1.20	1.60			
N		28	37	32			
Dry matter intake, kg	16M	8.87	9.10	9.17	9.05	0.39	Ns
	22M	8.44	8.87	8.74	8.68	0.45	Ns
	Mean	8.66	8.99	8.96	8.87	0.36	Ns
	SEM	0.37	0.35	0.35			
	p <	Ns	Ns	Ns	Ns		
Dry matter intake, %BW	16M	2.40	2.41	2.51	2.44	0.16	Ns
	22M	2.23	2.26	2.29	2.26	0.16	Ns
	Mean	2.32	2.33	2.40	2.35	0.16	Ns
	SEM	0.15	0.16	0.16			
	p <	Ns	Ns	Ns	Ns		
Dry matter conversion	16M	5.87	5.69	5.33	5.63	0.55	Ns
	22M	7.28	7.10	6.78	7.05	0.52	Ns
	Mean	6.58	6.39	6.05	6.34	0.57	Ns
	SEM	0.66	0.62	0.57			
	p <	*	*	*	*		
Crude protein intake	16M	0.95c	1.11b	1.24a	1.10	0.04	*
	22M	0.90c	1.09b	1.19a	1.06	0.05	*
	Mean	0.93c	1.10b	1.22a	1.08	0.05	*
	SEM	0.07	0.07	0.07			
	p <	Ns	Ns	Ns	Ns		
Neutral fiber intake, kg	16M	3.29a	2.82b	2.35c	2.82	0.14	*
	22M	3.15a	2.75b	2.24c	2.71	0.15	*
	Mean	3.22a	2.79b	2.30c	2.77	0.12	*
	SEM	0.24	0.22	0.20			
	p <	Ns	Ns	Ns	Ns		
Neutral fiber intake, %BW	16M	0.88a	0.73b	0.63c	0.75	0.08	*
	22M	0.83a	0.70b	0.59c	0.71	0.08	*
	Mean	0.86a	0.72b	0.61c	0.73	0.08	*
	SEM	0.08	0.08	0.06			
	p <	Ns	Ns	Ns	Ns		

Ns, not significant. Means followed by different letters are different (p < 0.05*).

The average DMI was similar to the values that were observed for young cattle finished on a feedlot and fed with a ration rich in nitrogen and energy (Véras et al., 2000). The NRC (2000) indicates that DMI should be between 2.3 to 2.5% of BW per day. Carvalho et al. (1997), when worked with concentrate levels of 20, 32.5, 57.5, and 70%, did not verify changes in the DMI as a result of the concentrate levels in the diets. The control of the food intake is a result of several mechanisms that are interrelated and integrated on the precise response on feed (Véras et al., 2000). The DMI is controlled by physiological, physical, and psychogenic factors. Dias et al. (2000) confirmed that the domination of one control mechanism of food intake over another is associated with the diet quality, the energy content, and digestibility, but the correlation with food intake can be positive or negative.

The higher CPI for high concentrate levels was calculated based on the CP content in the concentrate, since the increase in the concentrate levels in the diets occurred due to the substitution of forage (maize silage) for concentrate (corn + soybean). With a lower concentrate level in the diet (0.8% of BW), the CPI was less than the NRC (2000) concentrate level requirements for cattle in this animal category. On the other hand, for the higher concentrate level in the diet (1.6% of BW), the CPI was greater than the levels recommended by the NRC (2000). Likewise, the intermediate concentrate level in the diet (1.2% BW) met the recommendations of the NRC (2000) for beef cattle.

The higher NDFI for cattle that were fed with lower concentrate levels is related to a higher forage intake (maize silage), since an increase in the concentrate level in the diet reduced the maize silage intake, which represents the higher NDF content in terms of composition than the concentrate. However, NDF was lower (0.73% of BW) due to the quality of the maize silage and concentrate levels in the diets. Thus, no interference was observed by the FND on the feed intake of cattle on a feedlot.

The carcass length (CLE) and the leg length (LLE) were higher for 22M bulls than 16M bulls (Table 3). This difference occurred because 22M bulls were older and presented with greater bone and muscle development than the 16M bulls. The Longissimus dorsi muscle area (LMA) value was higher ($p < 0.05$) for 16M bulls than 22M bulls; however, when LMA was analyzed while considering the carcass weight, no difference was observed between 16 and 22M. Opposite to these results, Santos et al. (2008) observed that super early

cattle presented with a higher LMC value than early cattle.

The FAT was similar between 16 and 22M bulls. In general, cattle finished in a feedlot with high protein and energy content diets are slaughtered and found with 3 to 4 mm of fat (Rotta, et al., 2009a). Brazilian market requirements stipulate that cattle must have between 3 to 6 mm of FAT. This way, the 16 and 22M bulls meet the demands of the markets in Brazil. A greater amount of marbling in 22M bulls is related to the higher age of these animals. In general, cattle that are slaughtered at an advanced age present with higher intramuscular fat deposits, so they also have higher marbling (ROTTA et al., 2009a and b).

The COL, TEX, MUS%, and FAT% were similar between the 16 and 22M bulls. These variables are similar to the values observed in crossbred cattle, finished on a feedlot, and fed with diets containing high protein and energy contents (Rotta et al., 2009b). Thus, the slaughter age has little influence on the COL, TEX, MUSC%, and FAT% when cattle are slaughtered earlier than 24 months of age. On the other hand, cattle slaughtered at an earlier age (16M -16 months) present with a higher percentage of bone, since the bone tissue is deposited at a younger age.

Similar to this paper's results, Vaz et al. (2002) verified that the concentrate level in crossbred cattle did not change the characteristics of COL, TEX, MAR, and the carcass physical composition. In studies with Nellore (Carvalho et al., 1997) and crossbred animals (Zervoudakis et al., 2001), it was verified that different concentrate levels had no effects on the carcass physical composition. Berg and Butterfield (1976) reported that it were expected that animals fed with diets containing better energy levels would present with a better carcass conformation. However, the improvement in the energetic level of the diet is more evident in the carcass fat deposits. No difference was observed in fat percentage among the three energy levels used in this experiment. Vaz et al. (2005) did not observe a difference in the carcass fat percentage of crossbred cattle that were fed with three concentrate levels. The increment of concentrate in the diet was not large enough to show significant changes in the carcass characteristics (Silveira et al., 2009). The animal fat deposits are related to the slaughter age (Arboitte et al., 2004) and the energetic density of the diet (Restle et al., 2002). In this study, only the energetic density was evaluated, although it was not enough to increase the amount of fat in the

carcass. Similar results were observed by F. F. Silva et al. (2002). Different levels of concentrate in the diets have little influence over the carcass

characteristics of ½ Purunã vs. ½ Canchin cattle. Only two variables were influenced by the three concentrate levels that were used in the animals diet.

Table 3. Carcass characteristics of animals ½ Purunã vs. ½ Canchin slaughtered at three weights and two finishing systems.

Variables	Age	Concentrate levels, kg BW ⁻¹			Mean	SEM	P <
		0.80	1.20	1.60			
N		28	37	32			
Carcass length, cm	16M	129.9	128.8	129.0	129.3	0.62	Ns
	22M	131.7	130.8	133.8	132.1	0.69	Ns
	Mean	130.8	129.8	131.4	130.6	0.67	Ns
	SEM	0.84	0.78	0.79			
	p <	*	*	*			
Leg length, cm	16M	67.5	66.9	66.2	66.9	0.37	Ns
	22M	69.5	68.6	71.2	69.8	0.41	Ns
	Mean	68.5	67.8	68.7	68.3	0.38	Ns
	SEM	0.50	0.47	0.47			
	p <	*	*	*			
Cushion thickness, cm	16M	25.0b	26.6a	26.1a	25.9	0.21	*
	22M	26.0b	26.8a	27.2a	26.7	0.24	*
	Mean	25.5b	26.7a	26.7a	26.3	0.56	*
	SEM	0.29	0.27	0.27			
	p <	Ns	Ns	Ns			
Conformation, points	16M	14.0	14.4	14.5	14.3	0.28	Ns
	22M	13.3	14.0	13.8	13.7	0.31	Ns
	Mean	13.7	14.2	14.1	14.0	0.22	Ns
	SEM	0.37	0.35	0.35			
	p <	Ns	Ns	Ns			
Longissimus area, cm ²	16M	67.8	74.5	73.8	72.0	1.26	Ns
	22M	69.2	68.8	66.9	68.3	1.40	Ns
	Mean	68.5	71.7	70.3	70.2	1.31	Ns
	SEM	1.71	1.58	1.60			
	p <	*	*	*			
Longissimus area 100 kg ⁻¹ , cm ²	16M	26.4	27.8	27.6	27.3	0.39	Ns
	22M	27.6	26.4	25.9	26.6	0.43	Ns
	Mean	27.0	27.1	26.8	27.0	0.12	Ns
	SEM	0.52	0.48	0.49			
	p <	Ns	Ns	Ns			
Fat, mm	16M	4.46	4.26	4.21	4.31	0.19	Ns
	22M	3.77	4.25	4.13	4.05	0.21	Ns
	Mean	4.11	4.26	4.17	4.18	0.06	Ns
	SEM	0.25	0.24	0.24			
	p <	Ns	Ns	Ns			
Marbling, points	16M	4.92	5.00	5.18	5.03	0.26	Ns
	22M	5.80	5.92	5.93	5.88	0.29	Ns
	Mean	5.36	5.46	5.55	5.46	0.08	Ns
	SEM	0.35	0.33	0.33			
	p <	*	*	*			
Color, points	16M	3.54	4.16	3.88	3.86	0.11	Ns
	22M	3.80	3.83	3.47	3.70	0.12	Ns
	Mean	3.67	4.00	3.67	3.78	0.15	Ns
	SEM	0.15	0.14	0.14			
	p <	Ns	Ns	Ns			
Texture, points	16M	5.31	4.56	4.82	4.90	0.16	Ns
	22M	4.20	4.58	4.60	4.46	0.17	Ns
	Mean	4.75	4.57	4.71	4.68	0.08	Ns
	SEM	0.21	0.20	0.20			
	p <	Ns	Ns	Ns			
Muscle, %	16M	59.4	62.9	59.9	60.7	1.35	Ns
	22M	62.3	62.5	62.4	62.4	1.50	Ns
	Mean	60.8	62.7	62.2	61.9	0.80	Ns
	SEM	1.83	1.70	1.72			
	p <	Ns	Ns	Ns			
Fat, %	16M	26.6	23.1	26.9	25.5	1.34	Ns
	22M	21.8	23.8	23.3	23.0	1.49	Ns
	Mean	24.2	23.5	25.1	24.3	0.65	Ns
	SEM	1.82	1.69	1.70			
	p <	Ns	Ns	Ns			
Bone, %	16M	14.8a	14.9b	14.3b	14.7	0.21	*
	22M	16.1a	14.6b	15.1b	15.3	0.24	*
	Mean	15.5a	14.7b	14.7b	15.0	0.38	*
	SEM	0.29	0.27	0.27			
	p <	*	*	*			

Ns, not significant. Means followed by different letters are different (p < 0.05*).

Conclusion

To conclude the feedlot system of 120 days can be used to finish the 16 and 22M bulls without changing the slaughter weight. However, it is not easy to determine which system may be the most effective for finishing cattle, since changes in the desired carcass characteristics can occur. Furthermore, different concentrate levels in the diets of young bulls finished at 16 or 22M can be used without changing animal performance, but they do contribute to better food efficiency in cattle that are fed with lower concentrate contents in the diet. Concentrate level does not change carcass characteristics of cattle in both finishing system. Thus, the concentrate level in cattle diets have to be determined according to the ratio of costs/benefits.

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