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CONSTRUINDO SABERES, FORMANDO PESSOAS E TRANSFORMANDO A PRODUÇÃO ANIMAL

EFFECT OF THE DIETARY STARCH CONTENT AND AMYLOLYTIC EXOGENOUS ENZYMES ON MUSCLE AND FAT GROWTH OF FEEDLOT NELLORE CATTLE

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Abstract: This study was carried out to evaluate the effect of the starch content and amylolytic exogenous enzymes (AEE) inclusion in the diet on muscle and fat growth of feedlot Nellore cattle. Forty-eight non-castrated animals were allocated, according to their initial body weight, in a randomized block design with a 2 x 2 factorial arrangement (starch content x AEE). In the high starch content (HSC) diet the concentrate had 80% of cracked corn grain, whereas the low starch content (LSC) diet the corn grain was replaced by 20% of ground citrus pulp. The AEE source was the commercial product Amaze®. Ultrasound measurements of *Longissimus* muscle area (LMA), backfat thickness (BFT) and rump fat thickness (RFT) were taken at baseline and over the time on feed. There was no interaction between time on feed and starch content and/or AEE inclusion for any trait evaluated. However, in diets with AEE inclusion, animals fed HSC had higher RFT than animals fed LSC. In conclusion, AAE inclusion improves RFT deposition of feedlot Nellore cattle fed high concentrate diet with HSC when compared with LSC, but it does not alter LMA and BFT.

Key-words: backfat thickness, feed additive, high concentrate diet, *Longissimus* muscle area, rump fat thickness

Introduction

Intensive beef production systems rely on feeding large quantities of cereal grains, such as corn. Increasing starch concentration in the finishing diets may increase the concentration of glucose in the rumen, which stimulates the growth of lactate-producing microorganisms and increases the rate of fermentation, leading to a pH drop (Owens et al., 1998). This can reduce the digestion of the starch and lead to its loss through the feces, besides decreasing the efficiency of use of the feed by digestive tract alterations.

In order to improve the utilization of the diet, the amylolytic exogenous enzymes (AAE) have been used. The inclusion of AEE in ruminant diets has been shown to improve nutrient digestion and animal performance (Cruywagen and Goosen, 2004), but the AEE mode of action is not yet fully understood. Therefore, this study was carried out to evaluate the effect of the starch content and AEE inclusion in the diet on muscle and fat growth during the finishing phase of feedlot Nellore cattle.

Material and Methods

Forty-eight non-castrated animals (300 ± 34 kg body weight [BW]; 16 mo old) were allocated, according to the initial BW (block), in four collective pens (12 animals/pen), equipped with electronic gates to control individual feed intake, in a randomized block design with a 2 x 2 factorial arrangement (starch content x AEE) with 12 replications per treatment. The animals were fed diets containing 10% of roughage (sugarcane bagasse) and 90% concentrate (soybean meal, mineral mixture, corn grain and citrus pulp). In the high starch content (HSC; 49.2% of starch) concentrate had 80% of cracked corn grain, whereas the low starch content (LSC; 35.7% of starch) diet the corn grain was replaced by 20% of ground citrus pulp. The AEE source was the commercial product Amaze® (Alltech Inc. Ltda,

Araucaria, Parana, Brazil). Animals were gradually adapted to the finishing diets and facilities over a 30-d period and fed for a total of 136 days.

Ultrasound measurements were taken at baseline (day 0) and after 27, 55, 83, 111 and 136 days of feeding using an Aloka® equipment, model SSD 500 Micrus (Aloka Co. Ltd., Zug, Switzerland), with a linear probe 3.5 mHz and 172 mm in length. Ultrasound measurements between the 12th and 13th ribs were taken to determine the *Longissimus* muscle area (LMA) and backfat thickness (BFT). Other image was taken on the m. *Biceps femoris* muscle between the ilium and ischium to determine the rump fat thickness (RFT). Images were recorded and then interpreted using Lince® software by an experienced ultrasound technician.

All data were analyzed using the MIXED procedure of SAS software, using the starch level, AEE and its interaction as a fixed effect and block as a random effect. Animal was considered the experimental unit. Means were compared by Student's t test, and differences were considered statistically significant when $P \leq 0.05$.

Results and Discussion

There was no interaction between time on feed and starch content and/or AEE inclusion for any trait evaluated. On the other hand, an interaction between starch content and AEE was observed for RFT (Table 1). In diets with AEE, animals fed HSC had 39% higher RFT than animals fed LSC. However, in diets without AEE inclusion, no difference was observed on RFT in animals fed HSC or LSC. In HSC diet, no difference was observed on RFT in animals fed or not AEE. However, in LSC diet, animals fed AEE had 27% higher RFT than those not fed AEE.

No effect of starch content was observed for LMA and BFT (Table 2). However, animals fed AEE had lower LMA ($P < 0.001$) and BFT ($P = 0.033$) than those not fed AEE.

Table 1 – Rump fat thickness (BFT) evaluated by ultrasonography as a function of time on feed, starch content (SC) and amylolytic exogenous enzyme (AEE) inclusion

Trait	SC	AEE	Time on feed, d							SEM	*P*-value			
			0	27	55	83	111	136	Mean		SC	AEE	SC*AEE	Time
RFT, mm	High	With	1.0	1.6	2.9	3.7	4.6	4.7	3.1^{a,A}	0.21	0.001	0.302	0.020	<0.001
		Without	0.1	0.9	2.2	3.8	4.7	5.2	2.8^{a,A}					
	Low	With	0.5	0.7	1.3	2.2	3.2	3.5	1.9^{b,B}					
		Without	0.1	0.5	2.2	3.5	4.3	5.0	2.6^{a,A}					
	Mean		0.4	0.9	2.2	3.3	4.2	4.6						

^{a,b} Within SC, means with different small letters differ (P < 0.05).

^{A,B} Within AEE, means with different capital letters differ (P < 0.05).

Table 2 – Longissimus muscle area (LMA) and backfat thickness (BFT) evaluated by ultrasonography as a function of time on feed, starch content (SC) and amylolytic exogenous enzyme (AEE) inclusion.

Trait	Time on feed, d							SEM	*P*-value			
	0	27	55	83	111	136	Mean		SC	AEE	SC*AEE	Time
LMA, cm²	SC							0.48	0.312	<0.001	0.874	<0.001
High	50.4	53.8	59.9	64.7	68.7	69.2	61.1					
Low	49.2	54.1	60.6	64.7	69.4	72.9	61.8					
AEE												
With	49.4	53.6	58.6	63.4	67.4	67.6	60.1					
Without	49.8	54.3	61.8	66.1	70.8	74.4	61.9					
Time												
Mean	49.8	44.0	60.2	64.7	69.1	71.0						
BFT, mm	SC							0.14	0.668	0.033	0.342	<0.001
High	0.1	0.4	1.4	2.1	2.7	2.8	1.6					
Low	0.1	0.3	1.4	2.0	2.7	3.5	1.7					
AEE												
With	0.2	0.5	1.3	1.8	2.4	2.7	1.5					
Without	0.0	0.2	1.6	2.3	3.1	3.5	1.8					
Time												
Mean	0.1	0.4	1.4	2.1	2.7	3.1						

The AEE inclusion is expected to increase the availability of starch in the rumen and consequently increase the degradability and provide a higher energy intake, which would allow a greater deposition of muscle and fat in animals fed high concentrate diets. However, it was not observed in this study in relation to the LMA and BFT.

The variation in the response observed in BFT and RFT due to the AEE inclusion is poorly understood. These data could be attributed to the growth curve of animal, since animals with 300 kg BW would be expected to deposit a higher intensity of muscle when compared to fat (Owens et al., 1993), in combination with breed of low fat deposition potential. In addition, the inclusion of AEE in the HSC diet showed potential for improved RFT deposition, based on the growth curve and site of priority for fat deposition, the RFT is expected to be deposited first than BFT.

Conclusion

The AAE inclusion improves RFT deposition of feedlot Nellore cattle fed high concentrate diet with HSC, but it does not alter LMA and BFT of animals fed HSC or LSC over time on feed.

References

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