EFFECT OF THE DIETS INCLUSION OF NATURAL ADDITIVES ON MEAT QUALITY OF CROSSBRED CATTLE

C. A. Fugita[1], I. N. Prado[1], R. M. Prado[1], M. V. Valero[1], F. Zawadzki[1], D. C. Rivaroli[1], and C. Sañudo[2]

[1]Department of Animal Science, State University of Maringá, Av. Colombo, 5790, 87020–900, Maringá, Paraná, Brazil

[2]Department of Animal Production and Food Science, University of Zaragoza, C/Miguel Servet, 177, 50013 Zaragoza, Spain

Abstract – This experiment was carried out at the State University of Maringá, Brazil. Forty eight crossbred bulls with average of 318 kg and 22 months old were used in the experiment, and remained in feedlot for 94 days. The diets were composed of 50% concentrate and 50% roughage. Statistical design was completely randomized consisting of four treatments with different additives. The treatments were: Control (no additives added), Functional Oils, added 4 g / animal / day of functional oil (castor beans - Ricinus communis and cashew - Anacardium occidentale), Max, added 10 g / animal / day of Confimax® (mixture of carvacrol oil of oregano, Origanum vulgare, castor, cashew and yeast), and Yeast treatment added 5 g / animal / day of yeast (live yeast - Saccharomyces cerevisiae). Moisture, ash, crude protein, total lipids and color from muscle Longissimus were determined. Means were compared by Tukey test at 5% significance using the SAS. The addition of different additives in animal diets had no effect in moisture, ash, crude protein, total lipids and color from Longissimus muscle.

Key Words – Anacardium occidentale, Origanum vulgare, Ricinus communis, Yeast

- INTRODUCTION

Brazil is in a few years one of the major producers and exporters of beef worldwide. Brazilian cattle herd has over 180 million animals, and exportations in the year of 2011 totaled 1.795 million tons of meat [1], which represents over 20% of world exports.

Beef quality can be determined by several factors, either during the process of raising animals, or in the pre or post slaughter. Among the main factors inherent to the process of production that affect meat quality could be highlighted the breed, breeding system, food and nutrition, maturity and age at slaughter [2].

Regarding the production, about 90% of the Brazilian cattle meat production is finished in extensive system. However, the use of more intensive systems provided from a used area optimization, until a reduction of the slaughter age and, therefore, fails to improve the qualities of meat. One alternative for improving the feed efficiency in confined animals is using additives (feed modulators).

Due to the ban on the use of antibiotics as growth promoters in animal feed in Europe [3] is being stimulated the search for other products that can replace. In this sense, it is necessary to study the effects of potential natural replacing that improve the production system and the quality of meat from cattle finished in feedlots, to reduce barriers to Brazilian beef exportation to European countries.

Among these substances, extracts from essential oils with antimicrobial properties, have shown interesting results [4]. These compounds have been shown to be effective in modulating ruminal

fermentation and improve energy efficiency in ruminants and may result in greater in animal performance and consequently on meat quality.

The derivatives of oregano have antibacterial effects [5]. Castor and cashew oil have an antibacterial action acting as ionophores [6, 7]. Yeast works as rumen oxygen reduction, providing higher cellulolytic bacteria population and is likely to improve dry matter intake [8].

Studies with alternative additives in ruminant feed are scarce, especially regarding the quality of the beef in its chemical aspects. The aim of this study was to evaluate the inclusion of functional oils (cashew, castor oil and carvacrol) and yeast as feed additives on chemical composition of *Longissimus* muscle in crossbred steers finished in feedlot.

- MATERIALS AND METHODS

This work was realized at the State University of Maringá (Maringá, Paraná, Brazil). A total of 48 uncastred crossbred young bulls (F1 - ½ Nellore - ½ Angus) with average of 22 months old of age and weight of 318.23 ± 18 kg were used. Prior to the begin of the experiment, the animals had been placed in a pasture (*Cynodon spp. cv.* Tifton 85) without any supplements.

Calves were distributed in a completely randomized design and kept in 10-m^2 individual, partially covered pens with concrete floor, for a period of 94 days. Bulls were vaccinated for foot-and-mouth disease and dewormed.

Diets were formulated according to NRC [9] recommendations for gains of 1.5 kg / day (Table 1). Diets were offered twice a day, at 08h00 and 16h00.

The animals were randomized into the different treatments with twelve replications. The treatments were: Control, no additives added - CON, functional oils - FOL, Confimax - MAX and Yeast - YST. In OLI treatment was added 4 g / animal / day of functional oil from castor beans (50%) - *Ricinus communis* and cashew (50%) - *Anacardium occidentale*, MAX treatment were added 10 g / animal / day a mixture of carvacrol oil of oregano, *Origanum vulgare*, castor beans, cashew and yeast (CONFIMAX ®) to the ration. In LEV treatment were added 5 g / animal / day of live yeast - *Saccharomyces cerevisiae*.

The leftover feed supplied was weighed daily for evaluating consumption and adjust the intake of dry matter and other nutrients. Weekly samples were collected feed and leftovers. The animals were weighed every 21 days.

At the end of the experiment, the animals were weighed after 16 hours fast (solid food) and slaughtered at a commercial abattoir in the region. After slaughter, carcasses were divided medially through the sternum and vertebral column. The carcasses were then identified and kept in cold chambers at 2°C for for 24 hours.

Table 1 Chemical composition of diet ingredients and percentage composition (% DM) of the diet

	DM[1]				
Ingredients	DM	CP[2]	NDF[3]	TDN[4]	Diet%
C.S.[5]	30.30	7.87	40.29	61.78	50.00
C. G.[6]	87.68	9.95	21.44	79.69	45.01
S.M.[7]	90.12	49.57	11.68	82.54	4.33
M.S.[8]	99.00				0.33
Lim.[9]	99.00				0.33
Diet	59.17	10.56	30.3	70.3	100

[1]Dry matter, [2]crude protein, [3]neutral detergent fiber, [4]total digestible nutrients, [5]corn silage, [6]corn germ, [7]soybean meal, [8]mineral salt, [9]limestone.

After 24 hours the *Longissimus* muscle was sampled and each sample was identified by treatment and animal, and then vacuum packed and stored at – 18ºC to be performed in the laboratory analyzes. The analysis were performed at the Foods and Nutrition, Department of Animal Science.

After thawing at room temperature, the fat-less beef samples were ground so that moisture and ash rates could be determined, according to methodology by AOAC [10]. Whereas crude protein rates were calculated by the Kjeldahl method [11], total lipids were determined according to Bligh & Dyer [12], with a mixture of chloroform and methanol.

To analyse color, the samples were air exposed during 40 min for the reaction of myoglobin with atmospheric oxygen. Color was measured by portable device Minolta® CR10 colorimeter portable device with integrating sphere and viewing angle of 8° and illuminant C. The color assessment was based on the CIELab system, which evaluates the color reflectance of light in three dimensions: L * represents lightness and a * and b * representing redness and yellowness. Data were analyzed using the variance analysis of SAS [13]. Tukey test (P <5%) was used for means comparison.

- RESULTS AND DISCUSSION

The moisture and ash percentages on *Longissimus* were similar (P> 0.05) in all treatments (Table 2). The moisture and ashes averages were 72.7 and 1.0%, respectively. Similar results were observed by Cruz [14] working with crossbred calves with similar weight and age to the present experiment and finished in feedlot. In fact, the moisture and ashes are negatively correlated with the fat content of the muscle. Usually, when the levels of lipids increases there is a decrease of moisture and ash, since fat has low moisture content and ash [15].

Table 2 Meat quality of crossbred young bulls and feedlot terminated supplemented with different additives

	Treatments					
	CON[1]	FOL[2]	MAX[3]	YST[4]	S[5]	P[6]
N	12	12	12	12		
M.[7], %	72.64	73.05	72.60	72.49	1.17	ns
Ashes, %	1.06	1.06	1.08	1.07	0.05	ns
C.P.[8] %	22.60	23.11	23.43	23.38	0.79	ns
T.L.[9]%.	1.93	1.97	2.12	2.01	0.63	ns

[1]Control treatment, [2]functional oils, [3]confimax®, [4]yeast, [5]significance, [6]probability, [7]moisture, [8]crude protein, [9]total lipids.

The average percentage of crude protein in diets was similar to that reported by Maggioni et al. [16]. Crude protein rates in the *Longissimus* muscle of steers in general vary only slightly when diet is taken into account [17].

The percentage of total lipids observed in *Longissimus* muscle was not affected (P> 0.05) by treatments (Table 2). The observed values are considered low for this animal category finished in feedlot and fed a with high energy intake diet. In general, animals slaughtered prematurely have lower percentage of total lipids in *Longissimus*. Likewise, the physiological condition of the animals (uncastred males), provides less fat deposition in muscle, due to the action of steroid hormones that determines greater deposition of muscle tissue.

There was no significant differences observed in L*, a* and b* (Table 3) among animals supplemented with different additives in the diet. Similar data were observed by Maggioni et al.

[18] using animals in the similar condition to this work.

Table 3 Meat color of crossbred young bulls and feedlot terminated supplemented with different additives

	Treatments					
	CON[1]	FOL[2]	MAX[3]	YST[4]	S[5]	P[6]
N	12	12	12	12		
L[7],	38.65	37.57	37.24	36.45	2.56	ns
a*,	15.71	16.62	15.93	16.97	2.22	ns
b*[8]	9.09	8.83	9.19	9.28	1.40	ns

[1]Control treatment, [2]functional oils, [3]confimax®, [4]yeast, [5]significance, [6]probability,

- CONCLUSION

The use of different additives in the diet of crossbreed calves had not present significant results for the meat quality, in terms of chemical composition and color.

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