ESSENTIAL OILS ON FATTY ACIDS COMPOSITION OF MEAT FROM CROSSBRED BULLS FINISHED IN FEEDLOT

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Abstract – The addition in the diet of a mix of essential oils from oregano, garlic, lemon, rosemary, thyme, eucalyptus and sweet orange plants extracts was evaluated on fatty acids quality of meat of crossbred bulls finished in feedlot. Twenty seven young bulls from crossbred (½ Nellore vs. ½ Angus) were fed with a high energy diet during 4 months with one of the following diets: Without addition of mix essential oil (E0.0), with 3.5 g/animal/day of the essential oil (E3.5) and with 7.0 g/animal/day of the essential oil (E7.0). The fatty acid composition was determined on *Longissimus* muscle. The integration of peak areas was determined by Chronquest Software, version 5.0. The inclusion compound of essential oils had no effect on the composition of the fat of meat from crossbred cattle feedlot finished with high grain diet with the addition of essential oils to 3.5 g / animal / day.

I. INTRODUCTION

Essential oils are volatile and complex compounds obtained from natural plants or parts of them [1]. The plant extracts can be used in animal feed as additives for having antimicrobial activity, working in food digestion, anti-inflammatory and antioxidant effects [1]. Thus they are a natural alternative in livestock production to avoid bacterial resistance caused by antibiotics, which ones were commonly used in intensive animal production systems [2].

In this context, studies for obtaining natural products that have similar capacity of antibiotics have been the focus of researchers [3]. There are several studies about the mechanisms of essential oils in other species such as sheep [4], and poultry [5], but results are scarce in beef, which most of them are related to the direct action through processed meat. Due to this, the effects of essential oils addition in the diets of beef cattle demands more researches in vivo conditions. [1]. Thus, our objective was to investigate the possible effect on fatty acid composition of meat from crossbreed cattle, which diets without or with different levels of inclusion of essential oils mix.

II. MATERIALS AND METHODS

Twenty seven 12 month-old crossbred young bulls (F1 – ½ Angus vs. ½ Nellore), average weight of 243.2 ± 35.3 kg were randomly assigned to one of three finishing diets (n = 9 per treatment): diet without addition of mix essential oil (E0.0), diets with 3.5 and 7 g/animal/day of the essential oil mix (E3.5 and E7.0 respectively). The basal diet was the same for all animals, been formulated according to NRC [6] recommendations for a 1.50 kg average daily gain. Components of mix consisted on seven plants extracts: oregano (Origanum vulgare), garlic (Allium sativum), lemon (Citrus limonium), rosemary (Rosmarinus officinalis), thyme (Thymus vulgaris), eucalyptus (Eucalyptus saligna) and sweet orange (Citrus aurantium).

Animals were finished in intensive conditions (90:10) concentrate: roughage during 4 months until reach commercial weigh (440.3 ± 42.7 kg) and slaughtered in a commercial abattoir. After 24h, the *Longissimus* muscle was excised from the left side of the carcass. The *Longissimus* fatty acid composition was determined after transesterification of triacylglycerides to obtain the methyl esters according to ISO [7] method. The fatty acid methyl esters were separated in the gas chromatograph Thermo ultra trace model 3300, equipped with a flame ionization detector and a fused silica capillary column CP - 7420 (Select FAME). The flow of H2 (carrier gas) was 1.2 mL / min, 30 ml / min of N2 (make up); and 35 to 300 ml / min for the H2 and synthetic air. The volume injected was about 2.0 ul using Split 1:80 , with the injector and detector temperatures of 220 C and 230th respectively; while the column was 165 C for 10 min and at high rate of 4 ° C / min to 235 C and maintained for 8 min . Percentages were determined by

integration of peak areas by Chronquest Software , version 5.0.

The results were analyzed by variance analysis of SAS [8] statistical package (Statistical Analysis System, version 8.1) using the proc mixed procedure to compare the means by Tukey test at 5% probability.

III. RESULTS AND DISCUSSION

The principal fatty acid observed on *Longissimus* were palmitic (16:0), estearic (18:0) and oleic (18:1 n-9), representing 80% of total fatty acids identified (Table 1). These results are similar to those observed by Maggioni *et al*. [9].The fatty acid stearic (12.7%) has a big participation on beef meat, which was not modified by the additives inclusion in the diet. Fugita *et al.* [10] observed higher values (16.7% and 16.8%) than the present study, assessing the fatty acids composition of meat from crossbred cattle finished in feedlot with a lower use of concentrate in the diet (60%). Fats rich in stearic are classified as neutral fatty acid, without the harm effects to heart as other saturated fatty acids. This fatty acid is the final product of the rumen biohydrogenation [11].

The average content of saturated fatty acids myristic (14:0) and palmitic (16:0) observed were 2.3 and 30.9%. This two saturated fatty acids are known by hypercholesterolemic and are responsible by the increase of low density lipoprotein (LDL) which are responsible by coronaries diseases. Fugita *et al.* [10] observed lower values of these fatty acids on muscle of animals feed with 40% forage and 60% concentrate with addition of natural additives in the diet. The oleic fatty acids obtained average participation over 42% of total fatty acids identified. Similar values were observed by Ducatti *et al*. [12] in crossbred cattle finished in feedlot. The oleic fatty acid is important to reduce the LDL and increase the HDL content in blood. Due to this the presence of fatty acids is associated to the reduction of cardiovascular problems.

Among the unsaturated fatty acids, the linoleic fatty acids (18:2 n-6) and α-linoleic (18:3 n-3) (average 4.83 and 0.10% respectively) are classified as essential fatty acids [13]. Fugita *et al*. [10] assessing the addition of essential oils in the diets of crossbred cattle finished in feedlot, although with lower participation in the concentration in the diet (60%) observed lower values for linoleic acid (2.8%) and superior to α-linolenic (0.26%). This fatty acids, in ruminant, are biohydrogenated in rumen, resulting in conjugated linolenic acid – CLA (18:2 cis 9, trans 11) and estearic acid [11]. The CLA content and stearic acid were lower in the present study in comparison to study in feedlot, however with animals fed with lower concentrate content, indicating a possible reduction in the rumen biohydrogenation.

Table 1 Effects of essential oils inclusion on meat fatty acids composition of crossbred cattle finished in feedlot.

	Tratamento				
Fatty Acids	CON[1]	E3.5[2]	E7.0[3]	SEM[4]	P<F
12:0	0.03	0.03	0.03	0.00	0.78
14:0	2.23	2.64	2.06	0.11	0.09
14:1 *n*-9	0.41AB	0.58A	0.38B	0.03	0.02
15:0	0.33	0.30	0.31	0.01	0.68
15:1 *n*-9	0.66	0.75	0.84	0.05	0.42
16:0	31.14	31.50	30.01	0.51	0.48
16:1 *n*-7	2.29	2.62	2.14	0.10	0.18
17:0	0.98	0.74	0.92	0.04	0.06
17:1 *n*-9	0.70	0.65	0.72	0.05	0.86
18:0	13.13	12.24	12.79	0.31	0.53
18:1 *n*-9	42.73	41.64	42.43	0.59	0.76
18:1 *n*-7	0.80	0.98	0.94	0.04	0.22
18:2 *n*-6	3.85	4.89	5.76	0.48	0.27
18:3 *n*-3	0.10	0.12	0.10	0.00	0.59
18:2 *c*9-*t*11	0.04	0.05	0.04	0.00	0.67
20:3n-3	0.11	0.10	0.13	0.01	0.52
20:4 *n*-6	0.56	0.60	0.72	0.06	0.57
20:5 *n*-3	0.04	0.06	0.04	0.00	0.35

[1]Control – without addition of essential oils; [2]3.5 g/animal/day of essential oils; [3]7.0 g/animal/day of essential oils; [4]Standard error of means.

IV. CONCLUSION

The addition of essential oils had no effects in the composition of the fatty acids of meat from crossbred cattle finished in feedlot. Thus it can be used as an alternative additive without influencing the fat quality.

ACKNOWLEDGEMENTS

Appreciation is expressed to São Paulo Research Foundation – FAPESP (process 2012/18873-8 research support and 2012/11918-6, master scholarship).

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