EFFECT OF INCLUSION OF ESSENTIAL OILS ON CHEMICAL COMPOSITION OF MEAT OF CROSSBRED YOUNG BULLS FINISHED IN FEEDLOT

Rodrigo A. C. Passetti*[1], Dayane C. Rivaroli[1], André M. Jorge[2], Ivanor N. Prado[1], Fernando Zawadzki.[1], Mariana G. Ornaghi[1],

1 Department of Animal Science, Universidade Estadual de Maringá, Maringá, Brazil.

2 Department of Animal Production, Faculdade de Medicina Veterinaria e Zootecnia, Universidade Estadual Paulista, Botucatu, Sao Paulo, Brazil.

*rodrigo_zoo91@hotmail.com

Abstract – The objective of this study was to assess of the effects of the inclusion of essential oils (MixOil®) on meat chemical composition of young bulls finished in feedlot. Twenty seven 12 month-old crossbred (Angus vs. Nellore), average weight of 243.2 ± 35.3 kg were randomly assigned to one of three finishing diets composed with MixOil®: without addition of mix (E0.0), with 3.5 g/animal/day (E3.5) and with 7 g/animal/day (E7.0) of mix. Component of mix consisted on seven plants extracts: oregano, garlic, lemon, rosemary, thyme, eucalyptus and sweet orange. Animals were slaughter with 440 kg and carcasses were labeled and chilled for 24 h at 4oC. The left Longissimus thoracis from the 6th rib was used to quantify the chemical composition using Near Infrared Reflectance Spectroscopy (NIRS). Percentage of moisture, ash, crude protein, total lipids and collagen was unaffected by the addition of essential oils in the diets (73.9, 1.52, 22.8, 2.98 and 1.40 respectively; P>0,05). Collagen was lower due to the use of young animals, which in general presents low collagen in tissues. The addition of MixOil® at 3.5 or 7 g/animal/day in the diet of crossbred young bulls finishing under intensive conditions did not have detrimental effects in chemical composition of meat.

I. INTRODUCTION

In order to prevent diseases, metabolic disorders and improve feed efficiency, antibiotics, are used in livestock production systems, especially when animals were reared intensively [1]. However, since 2006 Europe Union have been restricting the use of antibiotics due to the emergence of bacterial resistances and the possible risk for human health due of residues in final products [2].

Essential oils are natural alternative additive, which are constituted by complex and volatile compounds extracted from plants. Improvement of feed efficiency and animal productive are benefits of essential oils activity in livestock due to their antimicrobial, digestive modulator in ruminal metabolism, anti-inflammatory and antioxidant effect [3]. However, the effects of essential oils inclusion in the final product meat developed on productive conditions are relatively scarce, especially in cattle which studies in literature are commonly related to dairy cows on milk production and composition [4]. More studies are necessary to investigate the possible effect of essential oils in beef diet could have in the meat quality due to the different activity in vitro than in vivo conditions [5]. Thus, this paper objective was to investigate the possible effect on the meat chemical composition of beef from crossbreed young bulls, which diets without supplemented or with different levels of an 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. At 24 h post-mortem, meat pH was measured using a Meter Text Model (Tradelab, Contagem MG Brazil) pH-meter and a penetration pH-electrode

at the point of 3rd lumbar vertebra. After, the Longissimus muscle (thoracis and lumborum) was excised from the left side of the carcass. The 6th rib was removed, weighed and kept frozen (-20 ºC) before being thawed and dissected into muscle, fat (subcutaneous and inter-muscular), bone and other tissues (tendons, fascias, blood vessels) according to Robelin *et al* [7] procedures. Next, the 6th rib was used to quantify the chemical composition (percentage of moisture, ash, crude protein, total lipids and collegen) using Near Infrared Reflectance Spectroscopy (NIRS-Food Scan).The results were analyzed by variance analysis with SAS [8] statistical package (Statistical Analysis System, version 8.1).Results are reported as least square means and reported according to treatment effects (diet). Significance was set at $P \leq 0.05$.

III. RESULTS AND DISCUSSION

The addition of essential oils did not affect the ultimate pH_{24} (Table 1). The values for the three diets were below 5.8; being considered as normal pH indicating that animals were not stressed at time of slaughter [9]. The pH observed in this study was similar than those obtained by Prado [10] in the same type of crossbred finishes in feedlot for 4 months. The lack of effect in this attribute is according to others studied where the effect of different natural additives as propolis in the diet also unaffected final pH, presenting animals from Nellore purebred slighter higher pH than our crossbred bulls [11].

Chemical composition was unaffected by the addition of essential oils in the diets (Table 1). The results from control group (E0.0) were not differing statistically from those that added different essential oils levels. Comparing the average of our treatments with the similar crossbred bulls from Prado *et al.* [12] studies, values obtained in this experiment showed similar percentage of moisture (73.9 vs. 73.7%), presenting our animals slightly lower percentage of crude protein (22.8 vs. 24.2%) and a higher ash (1.52 vs. 1.07%) and total lipids percentage (2.98 vs. 2.01%). Those differences can be related to the diet, since no differences are found in muscle chemical composition of animals from the same genetic group, except to amount of fat that is directly related to the composition of the diet. [12]. The results observed corroborate with the ones found by Maggioni *et al*. [13], who worked with crossbred animals, ½ Nelore vs. ½ Taurine finished in feedlot.

Table 1 Effect of inclusion of essential oils on final meat pH and chemical composition on *Longissimus* muscle of crossbred young bull meat.

Items	Essential oils			SEM[5]	P-*value*
	E0.0[1]	E3.5[2]	E7.0[3]		
pH_{24}	5.67	5.42	5.76	0.07	0.13
Moisture, %	74.02	73.86	74.01	0.20	0.94
Ash, %	1.52	1.65	1.40	0.04	0.12
Crude protein, %	22.61	22.79	22.94	0.14	0.67
Total lipids, %	2.96	3.12	2.80	0.15	0.72
Collagen,%	1.38	1.40	1.47	0.03	0.47

[1]Without essential oils; [2]3.5 g essential oils/animal/day; [3]7.0 g essential oils/animal/day. SEM: Standard error of mean. ns: not significant.

The collagen percentage on Longissimus muscle was similar among the bulls from three diets (Table 1). The observed mean value was low (1.40 mg/100 grams). The lack of differences among diet could be expected because it seems that variations in this component are mainly related to variations in breeds, aptitudes or precocity as showed by Christensen *et al*. [9]. In this study the bulls were young. In general, the Young animals presents low collagen in tissues [14].

IV. CONCLUSION

The addition of essential oils at 3.5 or 7 gr/animal/day in the diet of crossbred young bulls finishing in feedlot did not have detrimental effects on muscle chemical composition..

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