EFFECT OF ESSENTIAL OILS INCLUSION AND AGEING ON TEXTURE OF CROSSBRED YOUNG BULLS FINISHED ON FEEDLOT

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Abstract – The objectives of this study were to assess the effect of essential oils mix added on the diet and ageing (7 and 14 days) on texture (Warner Bratzler shear force) in the meat of bulls finished on feedlot. 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 which differed in the quantity of inclusion of mix compound essential oil (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 plant extracts: oregano (*Origanum vulgare*), garlic (*Allium sativum*), lemon (*Citrus limonium*), rosemary (*Rosmarinus officinalis*), thyme (*Thymus vulgaris*), eucalyptus (*Eucalyptus saligna*) and sweet orange (*Citrus aurantium*). Young bulls were finishing with their respective diets on intensive system (90:10 concentrate: roughage) during 4 months until reach commercial weigh (440.3 ± 42.7). After slaughter, the carcasses were labeled and chilled for 24 h at 4ºC and the *Longissimus* muscle was excised for evaluate shear force. Inclusion of essential oils and ageing time unaffected texture values on meat.

I. INTRODUCTION

There is estimated that the world population in 2050 will increase to 9.6 billion people [1], with this there is also an increase in food consumption. To meet this population growth the production systems require technologies that provide greater efficiency in the production meeting the requirements of consumers in relation to human health, product quality and welfare animal.

With the advancement in demand for sustainable utilization of food resources in the world, a growing number of studies on the use of alternative additives in animal nutrition is observed. Among the products used in animal feed, we highlight the essential oils, which are extracted from plants or from part of them.

Essential oils are natural additives that possess antimicrobial and antioxidant compounds, which act in different ways on gram-positive and gram-negative and may lead to death of them [2]. According Bergen *et al*. [3], essential oils improve energy efficiency, due to increase propionate production and reduce methane production, improve utilization of nitrogenous compounds, reducing the proteolytic bacteria and also reduce the incidence of rumen disorders since they reduce the production of acid lactic.

Studies have shown that diets containing essential oils cause feeling of well-being in animals due to the presence of aromas thus affecting the animal temperament thereby improving meat quality.

Meat tenderness is a feature that most influence the consumer acceptance and is related to factors such as race, genetics, age at slaughter and feed [4].

This study had the objective to evaluate the effect of different levels of essential oils on texture of meat crossbred steers finished in feedlot in the time 7 and 14 days of ageing.

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 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*).

Young bulls were finishing with their respective diets on intensive conditions (90:10 concentrate: roughage during 4 months until reach commercial weigh (440.3 ± 42.7 kg). Afterwards they were slaughtered at a commercial abattoir 20 km from feedlot after a solid feed fast according to cattle finishing routine in Brazil. After slaughter, carcasses were divided medially, identified and conditioned in freezers with temperature below 4ºC, and kept for 24 h. One 2.5-cm-thick steak between the 7th and the 9th ribs were obtained, weighted, vacuum-packed and aged either 48 h and 7 or 14 days before being frozen and stored (-20ºC) during one month.
For the texture analysis, each steaks were cooked in a grill pre-heated at 200 ºC until reaching an internal temperature of 70 ºC, for analysis using a texture analyzer Stable Micro Systems TAXT Plus (Texture Technologies 15 Corp., UK) with a Warner-Bratzler cell following the procedures described by Honikel [5]; Lepetit *et al.* [6]. The meat was cut into rectangular pieces of 1 cm^2 cross-section, perpendicular to the direction of muscle fibers.
The results were analyzed by variance analysis with SAS statistical package (Statistical Analysis System, version 8.1).

III. RESULTS AND DISCUSSION

Essential oils addition did not modify texture characteristics (Table 1), as happened when other natural additives as propolis are include in the diet of Nellore bulls finished in feedlot [7].

Table 1 Effect of essential oils inclusion and ageing on texture (Warner Bratzler shear force, kg) of crossbred young bulls

	Essential oils				
WBSF, kg	CON[1]	E3.5[2]	E7.0[3]	SEM[5]	P<F
0 days	5.99	5.08	5.81	0.32	0.49
7 days	4.88	3.92	4.90	0.31	0.37
14 days	5.04	3.97	4.51	0.29	0.34
SEM	0.37	0.27	0.30		
P-*value*	0.43	0.14	0.20		

[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.

Also ageing time unaffected texture values. Usually ageing has a significant effect in texture, decreasing values of shear force [8] but those studies were developed with European breeds. As, it has been previously reported meat from zebu cattle tend to be less tender than those from continental and British breeds attributed to differences in protein breakdown postmortem and calpain-calpastain activity [9] [10]. Because when zebu in genetic proportion of breed composition increase, the calpastatin/calpain ratio also increase, thus proteolysis due to calpain activity is reduced, therefore tenderness is smaller than in continental breeds [11]. Absence of significant differences between 0 and 14 days of ageing is agree with O'Connor *et al.* [9] who reported a slower rate of tenderization in crossbred from *Bos indicus* suggesting that meat from 3/8 *Bos indicus* cattle need aged for a sufficient period of time (approximately 21 d), to compensate for the delayed aging response associated with their higher calpastatin activities. So, our animals were only aged during 14 days, which explain the absence of statistical differences. Gomes et al. [12] obtained results in shear force similar to ours; presenting Nellore steers finished in feedlots values of 5.6 – 5.4 kg for 1 day of ageing and 4.8 – 4.5 kg for 7 days. Boles *et al.* [11] obtained values comprised between 4.1-5.1 kg for Brahman cross finished in pasture with 2 days of ageing and different times of chilled storage. So, our data can be considered as normal for a zebu breed.

IV. CONCLUSION

Inclusion of mix of essential oils and effect of ageing has not negative effect in shear force of meat.

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