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Effect of feeding essential oils on meat shelf life of feedlot finished Nellore cattle (#533)

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Introduction

The economic loss of the beef industry with meat degradation in the display is a factor that needs to be resolved to improve the quality of meat along with the shelf life. During storage, generally, the material which is used to packaging is polyvinyl chloride film (PVC), that allows the meat to be exposed to oxygen, accelerating oxidative processes and discoloration, resulting in a reduction of meat shelf life (Lavieri, 2014). The main causes of meat deterioration during display are lipid and myoglobin oxidation, which can negatively affect meat flavor, color, texture and nutritional quality (Prado, 2015; Maqsood, 2011). In this sense, several studies have been carried out to evaluate the effect of essential oils as a natural form to improve meat stability thus increasing meat shelf life since they are compounds extracted from plants and have antimicrobial and antioxidant properties (Acevedo, 2015; Navajas, 2013). Some compounds, such as oregano, thyme, thymol, carvacrol, eugenol, cinnamaldehyde have shown an antioxidant action potential in animal metabolism, affecting meat quality traits by improving storage stability (Bakkali et al., 2008; Fitzgerald et al., 2004, Naveena et al., 2014, Pereira et al., 2009). Thus, this study was performed to evaluate the effect of dietary essential oil inclusion on meat shelf life of feedlot finished Nellore cattle.

Methods

Forty-eight Nellore non-castrated males (400±25 kg body weight and 16 months old) were divided into two groups (n=24 each) and feedlot fed with two different diets: 1) CO - control diet (35% roughage [corn silage] and 65% concentrate [corn grain, soybean meal, mineral mix]); 2) EO - essential oil diet (CO diet + 150mg/kg of essential oil [blend of carvacrol, eugenol, cinnamaldehyde and pepper extract contain capsaicin] during 110 days. One animal of EO treatment did not adapt to the feedlot and was removed from the trial. At the end of feeding period, animals were slaughtered and after 24 hours of chilling, four 1.5 cm thick Longissimus thoracis muscle samples were collected, identified and overwrapped with oxygen-permeable film on polyfoam trays and displayed for 0, 3, 5 and 7 days under simulated retail display conditions (Vertical model, 125 LX, Auden, Brazil; 4 °C; 1000 lux illumination) to determine shelf life of meat as proposed by Vatansever et al. (2000). After each display period, pH and color were measured. Color was measured with standard illuminant A, observation angle of 10° and aperture of 30 mm as proposed by CIE (1986), pH was measured using an electrode probe attached to a portable pH meter (Hanna Instruments model HI99163, Sao Paulo, Brazil). After that, a subsample was removed to evaluate lipid oxidation. Total intramuscular lipid content was quantified as proposed by Bligh Dyer (1959) and lipid oxidation as proposed by Vyncke (1975) and modified by Sorensen and Jorgensen (1996), to find thiobarbituric acid reactive substances (TBARS). Total intramuscular lipid content data was analyzed by analysis of variance using the MIXED procedure of SAS 9.4 (SAS Institute Inc., Cary, NC) as a completely randomized design considering the diet as a fixed effect. The pH, lipid oxidation, and color data were evaluated as time repeated measurement considering diet, display time and their interaction as fixed effects. The covariance structures were tested for each characteristic and the best fitted was used.

Results

There was no significant treatments x time interaction for color, pH, and TBARS evaluated during display time. No effect of diet was observed for total intramuscular lipid content (Figure 1). No effects of treatment on TBARS values were unexpected, once essential oils are known to prevent lipid oxidation due to their antioxidant capacity as reported by Simitzis et al. (2008). However, Tauer (2019) working with broilers supplemented with essential oil of oregano also did not find differences in lipid oxidation, although it could be due to the low lipid content in broilers breasts. Similar pH results were found by Simitzi et al. (2010) working with finishing pigs fed oregano essential oil and Yagoubi (2018) working with lambs supplemented with rosemary essential oil. In addition, as reported by Simitzis et al. (2010) and Smeti et al. (2013), no changes in storage stability of pork and lamb supplemented with EO were observed. However, time effect on color, pH, and TBARS was observed (Table 1). Meat color values decreased while TBARS formation increased throughout the retail display time, which were expected since lipid and myoglobin oxidation play an important role in meat discoloration over storage time (Shange et al., 2018).

Conclusion

Carvacrol, eugenol, cinnamaldehyde and pepper extract contain capsaicin supplementation does not affect meat shelf life of feedlot finished Nellore cattle.

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Notes

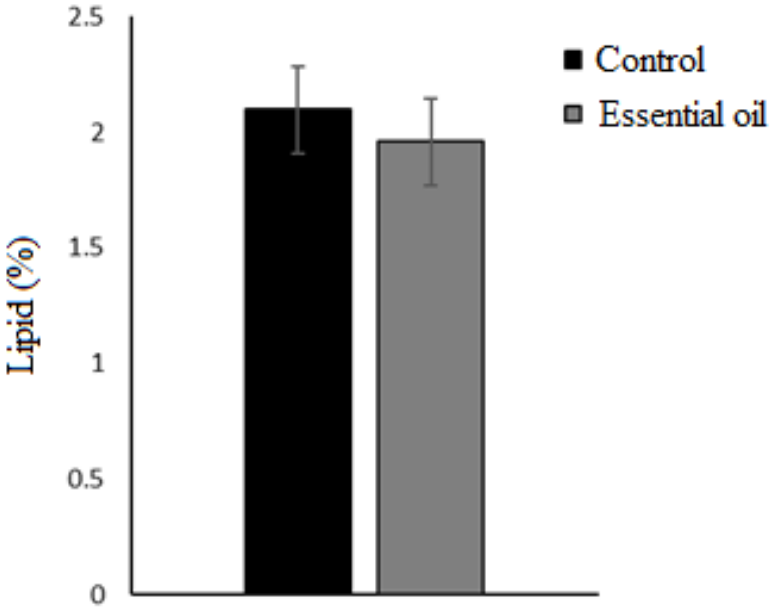

Figure 1.
Mean and standard error of the mean (SEM) of lipid content, according to the treatments.

Notes

Characteristics	Days				SEM	P	Effect
	0	3	5	7			
L*	44.0	46.0	45.4	43.5	0.47	<.0001	Q
a*	24.7	21.9	20.8	18.5	0.25	<.0001	L
b*	17.7	17.8	17.5	15.7	0.22	<.0001	L Q
pH	5.4	5.4	5.5	5.5	0.01	<.0001	L Q
TBARS (mg MDA/kg)	0.1	0.2	0.2	0.3	0.01	<.0001	L Q

Table 1. Mean, SEM, and probability of color, pH and TBARS under display conditions.
SEM: standard error of the mean; L*: luminosity; a*: red intensity; b*: yellow intensity; TBARS: Thiobarbituric acid reactive substances; MDA: malonaldehyde; Q; quadratic effect; L: linear effect; statisti-cally different when P<0,05.

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