LIPID OXIDATION OF MEAT AT RETAIL DISPLAY FROM NELLORE FED WITH VEGETABLE OILS

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Abstract – The aim of this study was to evaluate the lipid oxidation of meat at retail display for up to three days from cattle fed with vegetable oil sources. Ninety-six castrated Nellore cattle were fed with diets supplemented with soybean, sunflower or linseed oils substituted for corn and a diet without oil. After 81 days of feeding, animals were slaughtered and the meat was evaluated (pH, color, TBARS, cholesterol and cholesterol oxides). Color was not affected by any of the factors assessed and the diet did not influence the pH, TBARS values, lipids and cholesterol. There was no formation of 7-ketocholesterol, and the pH of the meat exposed to retail conditions for three days was higher when compared to the meat exposed for 1 day.

Key Words – meat, cholesterol, *longissimus*.

I. INTRODUCTION

The use of vegetable oils in the diet of cattle can accelerate lipid oxidation of meat in retail display conditions by increasing the amount of unsaturated fatty acids, leading to loss of quality and nutritional value, associated with the development of unpleasant odors and changes in color [1]. Thus, the objective was to evaluate the lipid oxidation of meat exposed to retail display conditions from cattle fed different sources of vegetable oil.

II. MATERIALS AND METHODS

Ninety-six 20-month-old castrated Nellore males were fed with corn silage (21% DM) and concentrate contained 3.5% soybean oil, sunflower oil or linseed oil, in substitution for corn and a diet without oil. After 81 days of feeding, animals were slaughtered (507.5 ± 17.3 kg and 5.2 mm of backfat thickness) and two steaks of m. *longissimus* (2.5 cm tick) were collected at 12th rib level and placed on Polyfoam trays, overwrapped with an oxygen-permeable polyvinylchloride film and stored for one and three days under simulated retail display conditions of illumination (Halogen light; 2000 lx) and temperature (0 - 2 °C). Meat pH was taken and color was evaluated by CIE *L* a* b** space (Model CM2500d Konica Minolta Brasil). Meat exposed for three days was also analyzed for TBARS [2], total lipid [3], cholesterol and cholesterol oxides [4]. The experiment was set up as a completely randomized block (initial body weight) design, using diet, days in retail display conditions and diet x days at retail display in the statistical model.

III. RESULTS AND DISCUSSION

There was no significant interaction between diets and days on the display. The pH was not affected by diet (Table 1); However, the pH of the meat exposed for three days was higher ($P < 0.01$) when compared to the meat exposed for one day; nevertheless, both values are within the range considered normal for beef [5]. Diet and days on the display did not influence meat color, different than reported by Rodas-González et al. [1] who observed gradual loss of red color and vividness after exposure for three days.

The TBARS values, lipids and cholesterol (Table 1) were not affected by treatments after three days of exposure, similar as noted by González et al. [6], which also found no differences in meat of cattle fed with the same oils.

The 7-ketocholesterol was not found in any samples analyzed. Ferioli et al. [7] evaluated beef packaged with modified atmosphere exposed for one, eight and eleven days at retail display conditions and observed the presence of this compound in all periods. It can be concluded that the cholesterol present in meats exposed for three days did not suffer

oxidation, which is favorable for human consumption, because the presence of oxidized compounds from the cholesterol can be harmful to human health.

Table 1. pH, color, lipids, lipids oxidation (TBARS) and cholesterol of m. *longissimus* in retail display up to three days from Nellore steers fed with different vegetable oils

Item[1]	Diet					Day			Probability		
	CON	SUN	LIN	SOY	SEM	1	3	SEM	Diet	Day	D*D
pH	5.5	5.5	5.5	5.5	0.01	5.5	5.6	0.01	0.29	<0.01	0.49
*L**	31.8	31.5	31.5	32.0	0.61	31.2	32.2	0.61	0.92	0.33	0.80
*a**	16.9	16.6	15.9	16.7	0.43	16.4	16.6	0.39	0.38	0.85	0.67
*b**	15.6	15.4	16.5	15.3	0.83	16.3	15.0	0.69	0.71	0.28	0.92
Retail display after 3 days											
Total lipids (%)	1.6	2.1	1.8	1.9	0.20	-	-	-	0.92	-	-
Cholesterol (mg/100g)	70.8	72.7	72.1	77.9	2.92	-	-	-	0.57	-	-
TBARS (mg MDA/kg tissue)	1.0	1.3	1.5	1.3	0.49	-	-	-	0.87	-	-

[1]CON: control diet without oil; SUN: diet with sunflower oil; LIN: diet with linseed oil; SOY: diet with soybean oil; SEM: standard error of mean; L*: lightness; a*: redness; b*: yellowness; D*D: Diet x Days at retail display.

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The values obtained for TBARS (Table 1) can be considered high compared to observed values by Oliveira et al. [8] in meat from cattle fed with cottonseed, flaxseed or soybeans, and by Rodas-González et al. [1] in meats exposed to retail conditions for three days. Despite this, all values found are below 2 mg/kg of tissue MDA, that according to Campo et al. [9], is the limit that meat be acceptable, with no rancid taste.

IV. CONCLUSION

Different vegetable oils can be used on the diet of fattening cattle because there is no change in appearance and nutritional quality of meat during retail display conditions for up to three days, and even the formation of compounds harmful to human health.

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