MEAT QUALITY AND OXIDATIVE STABILITY OF HIGH-VALUE CHICKEN MEAT CUTS FROM POULTRY FED WITH CANOLA MEAL

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I. INTRODUCTION

Recent research shows very positive aspects of poultry meat as an animal protein of high biological value for human nutrition [1]. The quality of chicken meat, with cuts such as breast, thigh, and leg, which are largely appreciated by consumers, is influenced by diet, management, and processing applied *post mortem*. Corn-soybean-based diets are largely used, with positive effects on the meat quality [2], but the cost negatively impacts the competitiveness of the poultry industry in Uruguay. Canola meal, a co-product resulting from the oil industry of *Brassica juncea or nappus*, with low-glucosinolates, and low-erucic acid, is an alternative source of protein for grower-finisher chickens, when included under 20% [3] with contradictory effects on the meat quality. Consequently, the aim of this research was to study the impact of the inclusion of canola meal, as a partial substitution of soybean meal, in the diet for growing chickens, on meat quality parameters such as p*H,* color, drip loss, and oxidative stability of high-value cuts such as breast, thigh, and leg.

II. MATERIALS AND METHODS

One hundred one-day-old Cobb-500 male chickens were reared until day 20 with a starter diet (22% CP;3000 kcal ME/kg), and at day 21 of age, 96 birds were distributed randomly in four experimental diets (n=24/diet; 21% CP and 3100 kcal ME/kg) *ad libitum,* a corn-soybean basal diet (0% canola meal; CM), and three other corn-soybean diets with 2,5%, 5%, and 10% of canola meal. On day 49, previous fasting, chickens were sacrificed in a commercial slaughterhouse. All procedures followed directives of the Honorary Animal Experimentation Commission, Udelar). After chilling, at 24 hours *post mortem,* p*H*, color, and drip loss were determined in the breast, thigh, and leg [4], then stored in vacuum at -20 °C. p*H* was measured with a Luton pH-201 penetration p*H* meter. For color, the CIE Lab method was applied (CIE,1976; L*; lightness, a*; redness and b*; yellowness) using a Minolta Lab (CR-10) colorimeter with a D65 standard light. Drip loss was determined by weight difference, expressed in %, in samples of each muscle suspended into polyethylene closed bags at +4 °C, after 24 hours. Lipid oxidation was measured through the TBARs described in del Puerto et al. [5]). Briefly, 1.5 grams of frozen meat was homogenized with 20 ml (KCl 0.1M, EDTA 0.02M, BHT0.3mM), with an Ultra-Turrax (IKA T18 Basic) at 8000 rpm for 20 seconds, centrifuged at 2000 *g* for 10 minutes at 4°C.One ml of the supernatant and one ml (0.5 ml, 1% 2-Thiobarbituric acid in HCl 125mM and 0.5 ml TCA 20%) were kept boiling for 30 min, then, placed in ice for 5 minutes and then 45 minutes at room temperature. Afterward, 2 ml of n-butanol was added, vortexed and centrifuged (3000 *g,* 10 min, 4°C). Then, absorbance was measured in a spectrophotometer (T70 UV/Vis, PG Instruments) at 535 nm and concentration of MDA, mg/kg meat, was calculated using its molar extinction coefficient. All data were presented as mean ± SEM. For each variable and cut studied, data was analyzed by ANOVA one way (NCSS software, 2021). When significance was obtained ($p<0.05$), the Tukey & Kramer test was used. Also an ANOVA GLM was performed with fixed effects of diet and muscle and the interactions.

III. RESULTS AND DISCUSSION

Canola meal inclusion as a partial substitute for soybean meal, at 2.5, 5, and 10% in the grower-finisher diet for chickens did not affect the growth of birds (not included) but modifications in quality parameters were observed in this work. p*H* decreased in breast with 5% of CM and in breast and thigh with 10% of CM (Table 1). Lightness and yellowness decrease in thigh, while in leg only redness decreased related to control (Table 1). The CM inclusion at 5 % and 10%, significantly decreased the drip loss in breast and thigh, whereas in leg all doses of CM caused a decrease in water loss at 24 hours *post*

mortem (Fig 1). The lipid oxidation measured by the TBARS expressed as MDA (mg/kg meat) (Table 2) shows an effect, particularly in leg, with a significant increase in the MDA for the 2.5 % of CM compared to the control. No effect was observed in breast or thigh. Overall effects could be attributed to an increase of lipids content, or an effect of polyphenol content of canola meal. Further research is being done to explain the effects observed in this study.

Table 1. Effect of canola meal (CM; 0, 2.5, 5 and 10 %) in diet on pH and color *L*a*b** in breast, thigh and leg.

CM, %	Breast				Thigh				Leg			
	pH	L*	a*	b*	pH	L*	a*	b*	pH	L*	a*	b*
0	6.09 a	54.7	-0.75	8.09	6.54 a	55.2 a	0.70	9.00 a	6.30	56.4	-0.26 a	7.14
2.5	6.02 a	54.7	-0.94	8.14	6.50 a	53.5 b	1.06	7.37 b	6.31	55.8	-0.28 a	7.61
5	5.98 b	54.2	-1.18	7.88	6.50 a	51.9 c	1.22	6.19 c	6.32	55.7	-0.76 b	7.55
10	5.96 b	55.1	-0.90	8.90	6.43 b	53.6 b	0.70	7.68 b	6.34	56.2	-0.84 b	7.34
p	0.01	ns	ns	ns	0.05	0.01	ns	0.01	ns	ns	0.03	ns

Data are mean of n=24, (SEM not shown). a, b: means significant difference between diets, p<0.05.

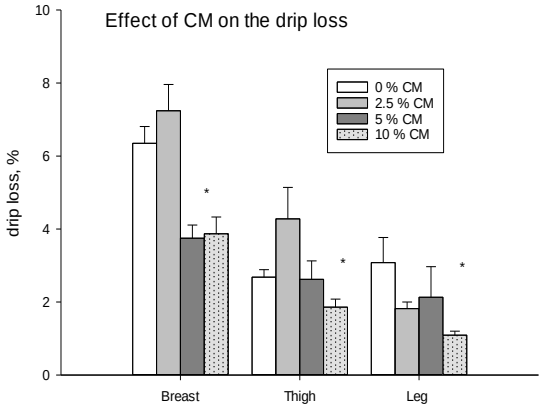

Figure 1. Drip loss (%) in breast, thigh and leg of poultry receiving 0, 2.5,5 and 10 % of canola meal (CM) in diet. Data are mean ± SEM (n=24). *= p<0.05

Main effects:
Diet p<0.01: 0%,2.5%>5%,10%
Muscle: p<0.01:breast>thigh,leg

CM, %	Breast	Thigh	Leg
0	0.30±0.02	0.51±0.05	0.36±0.03 b
2.5	0.39±0.04	0.44±0.04	0.55±0.05 a
5	0.43±0.05	0.53±0.04	0.52±0.05 ab
10	0.38±0.03	0.43±0.04	0.48±0.04 ab
p	ns	ns	0.01

Table 2. Effect of canola meal inclusion (CM; 0%, 2.5%, 5%, and 10%) in diet on lipid oxidation (MDA, mg/kg meat) of breast, thigh and leg. Data are mean ± SEM (n=6). a,b:means significant difference, p<0.05.

Main effects:
Diet p<0.03: 5%CM>0%CM
Muscle p<0.01: breast<thigh,leg

IV. CONCLUSION

Canola meal coming from *Brassica* improved for oil industry included at 2.5 to 10 % in chicken diet, positively impacted the meat quality, reducing the water loss in all studied cuts. The results of the effects on the pH, color, drip loss, and lipid oxidation were largely dependent on the muscle type.

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