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CARCASS CHARACTERISTICS, pH AND MEAT COLOR OF RABBIT FED DIETS WITH AND WITHOUT OMEGA-3 DIETARY SUPPLEMENTATION

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ABSTRACT

The first impression of consumers to some meat products is given by the conformation cut and color, and thus color is of utmost importance. The objective of the present work was to evaluate the carcass characteristics, color and pH in the *Longissimus dorsi* muscle in rabbits fed with or without omega-3 supplement. The trial was conducted in the experimental unit of University of Mexico State. Thirty two rabbits were evaluated (16 male and 16 female). Every rabbit was placed in individual cage (80cm x 60cm x 40 cm) and was fed a commercial diet (crude protein 18 %, fat 4 %, fiber 15.5%, calcium 1.1% and phosphorus 0.65%). (Control group), or the same diets supplemented with 40 mg/kg body weight omega 3 (experimental group) via oral for fifty days. At the end of the experiment the animals were slaughtered and different measurements were recorded (Slaughter weight, hot and cold carcass, carcass and leg length, rump perimeter, waist and chest width, drip loss and cans performance). One sample of *Longissimus dorsi* muscle was obtained for analysis of: color (L^* , a^* , b^* , C^* and H°) and pH in the same muscle. The results were analyzed as a randomized complete design using the MIXED procedure (SAS inst. Inc. Cary, NC, USA). Treatment (omega 3) means were separated by the probability of difference. To test the hypotheses, $P < 0.05$ was considered significant. All variables in carcass characteristic were similar ($P > 0.05$) for treatments and sex. With respect to color and pH values did not show any significant difference ($P > 0.05$) in treatments and sex.

Key words: rabbits, omega-3, carcass.

INTRODUCTION

The appearance of carcass, odor and meat color is the first traits that consumers perceive when assessing the external appearance of fresh meat products. The attributes of meat quality and carcass characteristics, pH, color, capacity of water retention, properties of texture, smell, taste, and most of the aromas perceived during mastication, cannot be considered independent, and all are related to each other and their interaction provides global quality and characteristics of the meat. The pH affects the stability and properties of proteins, and almost all the attributes important for meat quality, as the water holding capacity (texture) and color. The color is an indicator of the quality of the meat, so it can be used to assess the age of the animal being darker and generally harder to older because the muscles have higher amount of myoglobin. Actually exist in the industry different additives that change the characteristics of meat, the fatty acid omega-3 may be used for change the fatty acid profile intramuscular.

The aim of this study was to investigate the effect of the inclusion of omega-3 in the feed on carcass characteristics, color and pH in *longissimus dorsi* muscle of rabbits.

MATERIALS AND METHODS

Animals and experimental design.

Experimental procedures were reviewed and approved by the University of Mexico State Animal Care and Use Committee for Livestock.

Thirty two rabbits (initial body weight of 1.360 kg: New Zealand White) were used and housed individually in pens (80cm x 60cm x 40 cm) that allowed freedom of movement. A commercial diet (crud protein 18 %, fat 4 %, fiber 15.5%, calcium 1.1% and phosphorus 0.65%) was offered to rabbit during 50 days of experimental period. The experiment consisted in add out 40mg/kg of fatty acid omega-3.

The experiment was conducted as a randomized complete design to reach 16 observations per diet. In the end of experimental period all the animal was slaughter and characteristics carcass were measured. The carcass length, leg length, leg diameter, rump perimeter, rump width, waist width, chest width, slaughter weight, hot carcass weight, chilled carcass weight, drip losses and reference carcass was measured.

pH and color measurement.

pH of meat was determined using a meat pH meter (HANNA) equipped whit (HI 99163) spear shaped electrode. Color was measured whit Minolta Chromameter CR-400 (Minolta Co., Ltd., Osaka, Japan) using light source D65 and 8mm Ø measuring area, diffuse illumination and 0° viewing angle. The equipment was calibrated to white plate before each session of measurement. The CIELAB L* (lightness) a* (green-red) and b* (blue-yellow), H° (metric hue) and C* (croma) was used to determine the colour. Loin color was measured on the cut surface at the level of the 7th lumbar vertebra. pH was determined at the same location whit the electrode inserted 1 cm deep into the muscle.

Statistical analysis

Data were subjected to analysis of variance as a randomized complete design using the MIXED procedure (SAS inst. Inc. Cary, NC, USA). Treatment (omega 3) means were separated by the probability of difference. To test the hypotheses, P< 0.05 was considered significant.

RESULTS AND DISCUSSION

Results of the slaughter weight and carcass characteristics are summarized in table 1.

Table 1. Slaughter weight and carcass characteristics in rabbits fed with and without omega 3 diets

Concept	Diet		Sex		P-value	
	Control	Omega-3	Male	Female	Diet	Sex
Slaughter weight (kg)	2.94	2.92	2.98	2.881	0.89	0.11
Carcass (kg)						
Hot	1.52	1.51	1.55	1.43	0.84	0.06
Chilled	1.44	1.42	1.43	1.35	0.80	0.15
Length (cm)						
Carcass	37.68	38.08	38.19	37.23	0.42	0.068
Leg	18.20	18.28	18.35	18.02	0.81	0.35
Rump perimeter (cm)	26.32	26.33	26.63	25.65	0.97	0.07
Width (cm)						
Rump	7.99	7.92	8.02	7.11	0.66	0.19
Waist	6.12	6.07	6.15	5.97	0.67	0.15
Chest	9.87	9.60	9.76	9.68	0.17	0.74
Drip lossed (%)	5.17	5.55	5.30	5.66	0.49	0.53
Reference carcass (%)	49.03	48.66	48.26	47.99	0.59	0.84

The weight at slaughter of the rabbit was similar (P>0.05) in diet and sex. Different authors mention that ideal weight of slaughter rabbits for meat production is around two kg bodyweight (Combes, et al 2008). The comparison between hot and cold carcass did not show different results (P>0.05) respect to the treatment and sex. Dalle Zotte and Paci (2014) realized an experiment where slaughter rabbits to 2,808 kg bodyweight and the hot and cold carcass was 1,680 and 1,618 kg, respectively. In the present study using New Zealand rabbits and obtained low percentage in hot and cold carcass compared to experiment of Dalle Zotte and Paci where they using Vienna Blue and Burgundy breeds rabbits. The carcass and leg length was similar between treatment and sex (P>0.05); the rump, waist and chest width was similar (P>0.05) in the diets and sex. The percentage of drip losses and reference carcass do not show different results (P>0.05) in the diets and sex. Currently, there is little information about measurements of lengths and perimeters of primal cut in the carcass of rabbits.

Results of the pH and color measurement in the *Longissimus dorsi* are summarized in table 2. Diet and sex no affected the meat color and pH at 45 min and 24 h ($P>0.05$). Paci et al. (2013). Found high value (58.3) in L* color compared to this experiment (50.04 diet and 49.85 sex). Maj et al (2012) found higher values in a* and b* color, while in C* and H° the report value was lower, compared to this experiment. The value founded between difference experiments is attributable to age and weight at slaughter because older animals contain more myoglobin. A greater myoglobin concentration yields a more intense color (Boles and Pegg, 2010). With respect to pH Nakyinsige et al (2014) obtained similar results at 45 min and 24 h. The changes in pH affected the protein charge of the muscle. These changes alter the space between the meat fibers, affecting the absorption of light changing the visual appearance of meat.

Table 2. Colour and pH parameters of *Longissimus dorsi* muscle in rabbits of different groups fed with our without omega 3 diets

Concept	Diet		Sex		P-value	
	Control	Omega 3	Male	Female	Diet	Sex
L*	50.60	49.49	50.32	49.39	0.32	0.44
a*	4.02	3.98	4.25	3.43	0.94	0.17
b*	4.62	4.76	4.83	4.39	0.72	0.30
C*	6.18	6.25	6.47	5.65	0.91	0.22
H°	49.87	50.80	49.39	52.50	0.75	0.32
pH ¹	6.86	6.95	6.87	6.98	0.48	0.49
pH ²	5.91	5.86	5.89	5.86	0.46	0.68

1= 45 min. 2= 24 h. L*= lightness, a*= green-red, b*= blue-yellow, C*= chroma y H°= metric hue.

CONCLUSIONS

The inclusion of fatty acid omega-3 in the feed for rabbits did not affect the differences between male and female for the carcass characteristics, color and pH.

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