COOKING EFFECT ON ANTIOXIDANT ACTIVITY OF POULTRY MEAT ENRICHED WITH n-3 BY CHIA SEEDS IN THE DIET

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I. INTRODUCTION

Poultry meat is highly consumed worldwide and is a good source of proteins, essential amino acids, vitamins, and fat. Besides, it has more unsaturated fatty acids than red meat [1]. Several strategies have been tested to improve the meat´s nutritional profile to address major public health concerns [2], such as obesity, cardiovascular disease, diabetes, and some types of cancer. Chia seed is a promising source of *n*-3 polyunsaturated fatty acids (PUFA), especially α-linolenic acid, and antioxidant compounds such as flavonoids, anthocyanins, vitamins, and carotenoids [3]. Previous research showed that the inclusion of chia in the diet of broilers and rabbits was able to increase PUFA concentrations and decrease saturated fatty acid (SFA) content in meat [4,5]. During heat treatment application, a high percentage of water is lost, and chemical complexes are developed that alter the chemical structure and favor the oxidation of lipids in the meat. There is not much information about what happens with the antioxidant activity of meat during cooking, therefore, this study aimed to investigate the cooking effect on cooking loss and the antioxidant activity of poultry meat enriched with n-3.

II. MATERIALS AND METHODS

Two hundred one-day-old male Ross chickens were fed a starter diet, corn-soybean base (21.7% CP, 2998 kcal/kg ME). After 21 days, 96 birds were randomly selected and divided into four groups receiving one of the following diets *ad libitum* (iso-proteic and isoenergetic): a corn-soybean base diet (control group), and three groups with the inclusion of 2.5%, 5%, and 10% chia seed. On day 49, all the chickens were sacrificed in a commercial slaughterhouse according to CHEA (Honorary Animal Experimentation Commission, protocol N°702). After chilling, carcasses were transported to the laboratory, and twelve *Pectoralis major* muscles from each group were removed and conditioned in polyfoam trays overwrapped with oxygen-permeable PVC film. Trays were kept in a commercial case (CE, SS1500 model, 1.25 m height, 90 cm wide, 1.50 m long) with artificial light at 2–8°C for 4 days, simulating retail display conditions. Afterward, they were vacuum packaged and frozen at −80°C. Meat samples were cooked by placing 30 g in a vacuum-sealed sous-vide bag in a water tank for 60 minutes at 75°C, chilled in an ice bath for 30 minutes, and then kept at -80°C. The percentage of cooking loss was calculated by the difference in weight of meat samples before and after cooking. Antioxidant activity in raw and cooked poultry meat was determined by the ABTS radical scavenging activity assay [6]. Briefly, 1.5 g of meat was homogenized with 7.5 ml of methanol in an Ultra-turrax (IKA T18 Basic) at 8000 rpm for 20 seconds, and later centrifuged at 4000 *g* for 10 minutes at 4°C. The supernatant was filtered (Whatman N°1) and incubated with the working solution (ABTS) in a stirrer plate (Unimax 1010, Heidolph) at 160 rpm in the dark for 30 minutes. A calibration curve with Trolox was done, and the absorbance was measured in a spectrophotometer (T70 UV/Vis, PG Instruments) at 734 nm. The antioxidant activity was expressed as µmol Trolox Equivalent (TEq)/g of fresh meat. The data were analyzed with the NCSS program. A significance level of $P<0.05$ was established. A one-way ANOVA followed by the Tukey & Kramer test was used to analyze the diet treatment effect for the cooking water loss data and the antioxidant activity data within the raw and cooked meat. A repeated measures ANOVA followed by the Tukey & Kramer test was used to evaluate the main effects of cooking and diet treatment on the antioxidant activity data.

III. RESULTS AND DISCUSSION

The mean values for cooking loss (Figure 1) ranged from 28.91% ± 1.09 in meat from the control group to 31.20% ± 0.95 from the 2.5% inclusion of chia seed group. No differences between poultry meat from the four diet treatments were observed in the cooking loss results.

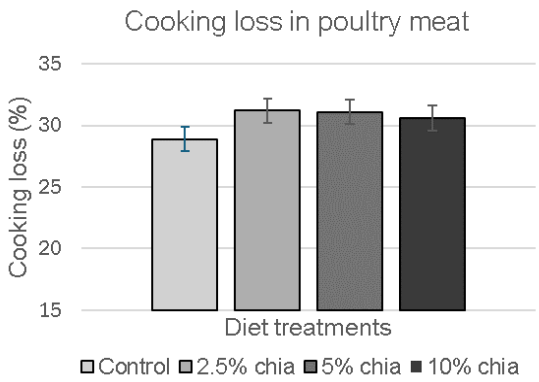

Figure 1. Cooking loss (%) of poultry meat enriched with n-3 by increasing levels of chia seed in the diet (2.5%, 5%, and 10%). Results are mean +/- SEM (n=12).

Antioxidant activity results in raw and cooked poultry meat enriched with n-3 are shown in Figure 2. Cooked poultry meat presented lower values of ABTS than raw meat (main effect, P<0.0001). Within raw meat, no differences between diet treatment groups were found. Despite this, meat from the control group (corn-soy diet) presented a lower antioxidant activity compared to the 10% chia seed group within cooked meat. This result could be explained by the antioxidants present in chia seeds, which could have protected poultry meat from oxidation during the cooking process.

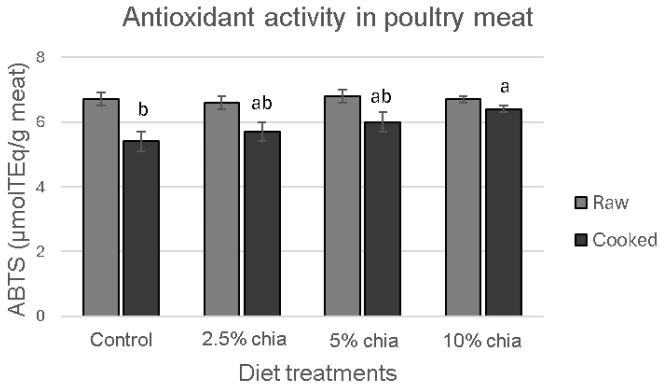

Figure 2. Antioxidant activity measured as ABTS (µmol TEq/g meat) in poultry meat enriched with n-3 by increasing levels of chia seed in the diet (2.5%, 5%, and 10%). Results are mean +/- SEM (n=12). Main effects: diet treatment NS; cooking (P<0.0001, raw>cooked); diet x cooking NS.

IV. CONCLUSION

A 10% chia seed inclusion in the poultry diet can increase the antioxidant activity of cooked meat compared to a corn-soy conventional diet.

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