Proximate analysis of free range and commercially-raised broilers available in retail outlets in Lubbock, Texas.

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Abstract

This study was conducted with the objective of comparing the proximate composition of raw and oven-roasted (end-point cooking temperature of 74° C), light (breast) and dark (drums and thighs) broiler meat (with and without skin) produced under conventional or free range management methods. A total of 48 whole broiler carcasses, half labeled as "free range" and half conventionally produced were purchased on two different days from a total of four retail locations in Lubbock, Texas. Data was collected on parts yields and cooking losses. Preliminary information collected demonstrates the effect of marketing of these products, which gives importance to this study - free range poultry is much more expensive than conventional poultry, and there appears to be growing demand for this product. This study will provide preliminary data to demonstrate if significant compositional differences exist between broiler meats produced conventionally or in "free range" systems. Moisture of broiler meat was significantly decreased, while protein and lipids increased by cooking in the treatment. Generally, the free range and commercial light and dark muscles did not differ significantly (P<0.05) for moisture, fat, protein and ash. Commercial dark muscles were significantly higher (p < 0.05) than free range, cooked, dark muscle in ash. Free range and commercial skin differed significantly (P<0.05) in moisture and lipids in both cooked and raw broilers.

Introduction

From January 2015 to January 2016, the consumption of chicken increased 6% in the United States (USDA 2016). Consequently, supermarkets often offer a variety of chicken products, which differ in handling and production methods; among these are commercial, free range, organic, and other classifications based on pre- and post-processing of the birds.

According to the United States Department of Agriculture (USDA), in order for broilers to be marketed under the name free range, "Producers must demonstrate to the Agency that the poultry has been allowed access to the outside" (2015). Although chicken sold as free range is not necessarily produced organically, products labeled in this fashion have a higher price due to consumer perception that this method of production ensures a high regard for animal welfare (Husak et al, 2008).

Due to the lack of a broad base of scientific studies that provide nutritional differentiation between commercial and free range broilers, as well as the obvious consumer interest in these products, the present study was designed to compare the proximate characteristics of free range, and conventionally raised broilers available to consumers in the marketplace. Such information enables consumers to make more informed decisions when purchasing chicken products. Furthermore, this study will supplement the information contained in the nutrient database maintained by the United States Department of Agriculture.

The objective of the study are:

Assessment of the proximate composition of raw and oven roasted, light (breast) and dark (drums and thighs) broiler meat produced under conventional and free range management methods.

Materials and Methods

AOAC methods were performed: Moisture 950.46; Ash 920.153; Protein (automated method) 992.15 and Chloroform/Methanol lipid extraction 983.23.

Data was analyzed using a procedure of XLSTAT: Tukey test was conducted with a predetermined level α=0.05.

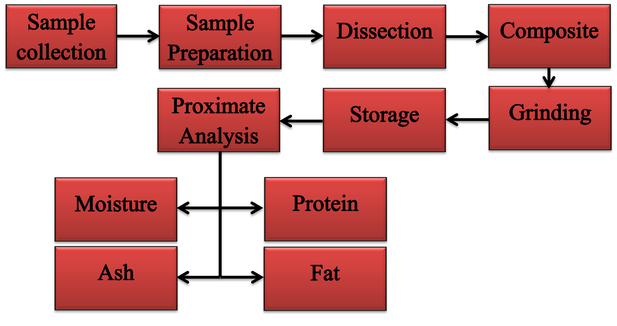

Figure 1. Process diagram.

Results and Discussion

Table 1. Legend of each treatment performed.

Initialism	Meaning
RC	Raw comercial
RF	Raw free range
CC	Cooked comercial
CF	Cooked free range
RCD	Raw comercial dark meat
RFD	Raw free range dark meat
RFL	Raw free range light meat
RCL	Raw comercial light meat
RCS	Raw comercial skin
RFS	Raw free range skin
CCD	Cooked comercial dark meat
CFD	Cooked free range dark meat
CCL	Cooked comercial light meat
CFL	Cooked free range light meat
CCS	Cooked comercial skin
CFS	Cooked free range skin

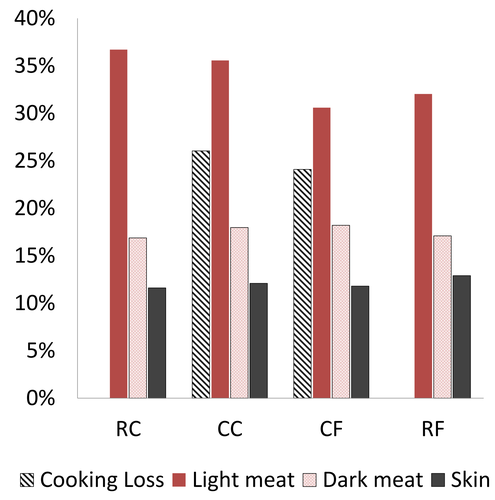

Figure 2. Mean yields of cooked and raw carcass components (light meat, dark meat, skin) from free range and commercial broilers.

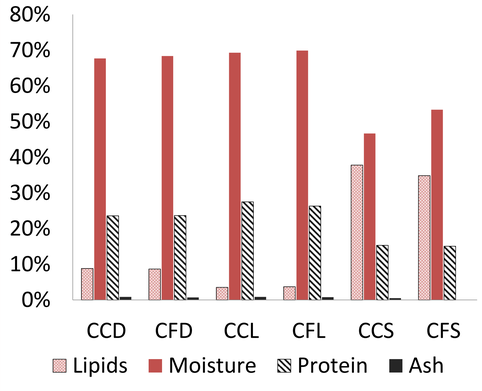

Figure 3. Mean values of cooked chicken components (light meat, dark meat, skin) from free range and commercial broilers.

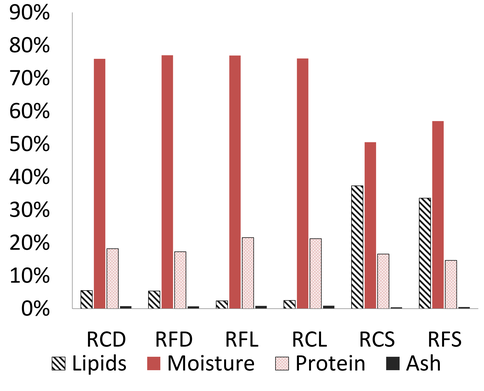

Figure 4. Mean values of raw chicken components (light meat, dark meat, skin) from free range and commercial broilers.

Table 2. Means values for proximate analysis (%) of raw and cooked light meat, dark meat, and skin from free range and commercial broilers.

	Moisture (%)	Protein (%)	Lipids (%)	Ash (%)	Kcal/100g
Raw					
RCD	75.89 ^{a}	18.24 ^{b}	5.51 ^{a}	0.75 ^{a}	122.59 ^{a}
RFD	76.97 ^{a}	17.29 ^{b,c}	5.38 ^{a}	0.7 ^{a,b}	117.62 ^{a}
RFL	76.90 ^{a}	21.6 ^{a}	2.38 ^{b}	0.85 a	107.84 ^{b}
RCL	75.99 ^{a}	21.26 ^{a}	2.49 ^{b}	0.88 ^{a}	107.55 ^{b}
RCS	50.57 ^{b}	16.6 ^{b,c}	37.33 ^{c}	0.41 ^{b,c}	397.32 ^{c}
RFS	56.97 ^{c}	14.68 ^{c}	33.58 ^{d}	0.48 ^{c}	362.55 ^{d}
Cooked					
CCD	67.67 ^{b}	23.58 ^{b}	8.83 ^{a}	0.85 ^{a}	173.87 ^{a}
CFD	68.36 ^{a,b}	23.66 ^{b}	8.68 ^{a}	0.71 ^{b}	172.84 ^{a}
CCL	69.27 ^{a,b}	27.51 ^{a}	3.52 ^{b}	0.86 ^{a}	141.80 ^{b}
CFL	69.87 ^{a}	26.32 ^{a}	3.70 ^{b}	0.79 ^{a,b}	138.67 ^{b}
CCS	46.64 ^{c}	15.31 ^{c}	37.80 ^{c}	0.51 ^{c}	406.60 ^{c}
CFS	53.31 ^{d}	15.07 ^{c}	34.84 ^{d}	0.52 ^{c}	369.67 ^{d}

$^{a-d}$ Means within a column and treatment lacking a common superscript letter differ (p<0.05)

Conclusion:

The most significant differences observed in this study between free range and commercial broilers were found in moisture and lipids from the skin. Free range broilers had a higher moisture content and lower fat content. This suggests a free range broiler might be healthier to consume with skin, considering that skin represents about 10% of the animal. However, these results do not support the price increase between the two types of marketed nutritionally birds.

References:

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USDA United States Department of Agriculture

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